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MSs. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE AMERICAN CHEMICAL SOCIETY AND SECTION C OF THE AMERICAN ASSO- CIATION FOR THE ADVANCEMENT OF SCIENCE

II

ORGANIC CHEMISTRY SECTION

Julius Stieglitz, Chairman

Stereoisomeric Chlorimido Esters: W. S. HILPERT.

The work is an elaboration and continuation of the work of Stieglitz and Earle, who in 1903 discovered the stereoisomeric chlorimido esters of meta-nitro-benzoic acid.

The new stereoisomers discovered are: methyl chlorimido p-nitrobenzoates, ethyl chlorimido p-nitrobenzoates, methyl chlorimido 4-methyl-3-nitrobenzoates, methyl chlorimido beta-naphtoates, ethyl chlorimido beta-naphtoates.

For each pair of isomers identity of structure was proven by chemical means; the impossibility of polymeric forms being present was substantiated by molecular weight determinations, and physical or crystal isomerism was shown to be absent by the fact that each of every pair of stereoisomers maintained its identity in all changes of physical conditions.

The Applications of Physical Chemistry to Organic Chemistry: JULIUS STIEGLITZ.

The author first called attention to the valuable aid given by physico-chemical methods in the study of isomerism, of stereoisomerism of the asymmetric type and of the "cis-trans" type, and of tauto-

merism, *i. e.*, in the study of organic compounds of the same composition but of different identity. Then it was shown how the mode of action of organic compounds may be analyzed by physico-chemical methods, the active component being found by properly planned determinations of velocities of action or of electromotive forces. Illustrations were drawn from the author's work, theoretical and experimental, on the theory of the catalytic action of acids, which showed that the accelerations produced by the catalyzing acid are simply due to the fact that the reacting component in such actions (esterification, saponification, inversion, amidine formation, etc.) is a positive ion whose *mass* (concentration) *is increased* by the addition of the acid. In the oxidation of aldehydes by silver nitrate in alkaline media (or of glucose by alkaline copper solutions), it was shown that the alkali is used to increase the concentration of the *reducing component of the aldehyde*, *e. g.*, $(\text{NuO})\text{CH}$, a methylene derivative with a bivalent carbon atom holding a free positive and a free negative charge. The alkali by suppressing the silver ion has a retarding effect on the oxidizing power of the silver nitrate. The demonstration was made with Ostwald's chemometric device.

The Condensation of Nitromalonic Aldehyde with Acetonyl Acetone: W. J. HALL.

From earlier work upon the condensation of nitromalonic aldehyde with acetone and its derivatives it may be inferred that two molecules of the aldehyde would condense with one molecule of acetonyl acetone and give a dinitro-dioxy-diphenyl. This result is accomplished only in the presence of a large amount of the condensing agent, otherwise but one molecule of the aldehyde enters into the condensation and there results a 2-acetonyl-4-nitro-

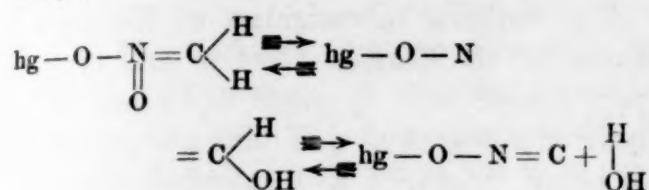
phenol. Both of these products, however, form but a small percentage of the total yield in condensation products. The third and largest portion arises from the condensation between one molecule of the aldehyde and one molecule of acetonyl acetone in which the two methylenic groups, between the two carbonyl groups, are found to react with the two aldehydic groups of the single molecule. In this way a fine carbon ring is formed which bears as substituents two acetyl groups and also a nitro group—a 1-nitro-3, 4-diacetylcyclopentadiene. This constitutes therefore a synthesis for derivatives of this class of homocyclic compounds. A number of similar condensations are already under investigation.

The Conversion of Nitromethane into Fulminates: LAUDER WILLIAM JONES.

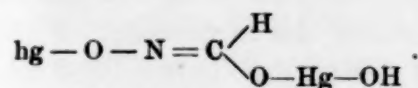
When a cold solution of mercuric chloride is poured into a cold solution of sodium isonitromethane, a white salt is precipitated, which Nef (*Ann.*, 280, 275) assumed to be mercuric isonitromethane. This salt has been isolated, and has been found to be nearly white and quite explosive. Its reactions show that it is undoubtedly mercuric isonitromethane. If this white salt is heated with water it passes very readily into mercuric fulminate, with the simultaneous formation of the explosive, yellow salt studied by V. Meyer and Rillet (*Ber.*, 5, 1030), Nef, and others.

The formation of formhydroxamic acid derivatives by the action of acyl chlorides upon sodium isonitromethane (*Am. Chem. J.*, 20, 25), and the successful transformation of formhydroxamic acid derivatives into fulminates by Biddle (*Ann.*, 310, 13), Nef (*Ann.*, 280, 317) and Wieland (*Ber.*, 40, 418) suggest an interpretation of the changes which mercuric isonitromethane undergoes in its conversion into fulminate.

($hg = \frac{1}{2}$ an atomic weight of bivalent mercury.)

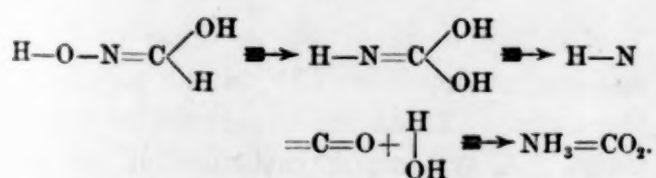


The yellow salt formed at the same time may be a basic mercury salt of formhydroximic acid,



This explanation was offered (*Ann.*, 20, 34) in view of the fact that the yellow salt, upon treatment with dilute hydrochloric acid, yielded some fulminate. Wohler (*Ber.*, 38, 1351) failed to obtain fulminate from this salt. Recently, a repetition of these experiments has yielded fulminate repeatedly.

If the reactions represented by the equations given above are assumed to be slightly reversible, it is possible to account for many of the singular changes of the fulminates. Thus, the change of fulminate into formhydroximic acid would account for the decomposition of fulminates into hydroxylamine and formic acid. By the Beckmann rearrangement, formhydroximic acid might be expected to pass into isocyanic acid, or into ammonia and carbon dioxide.



This would serve to clear up the behavior of fulminates towards acetyl chloride, ammonia, aniline, thiocyanic acid and certain other reagents.

In 1856 Kekulé represented fulminic acid as nitro acetonitrile, $CH_2(NO_2)(CN)$. The chief experimental evidence for this formula lay in the fact that mercuric ful-

minate, under the influence of chlorine water, gave trichloronitromethane (chlorpikrine), and a small amount of chlorcyanogen. The formation of trichloronitromethane has never been explained; but its formation becomes self-evident in view of the above hypothesis, since mercuric isonitromethane in the presence of mercuric fulminate would be changed ultimately into trichloronitromethane, free fulminic acid, and mercuric chloride by the continued action of chlorine water. The presence of a small amount of chlorcyanogen may be accounted for by the presence of prussic acid, a substance very often formed by the breaking down of free fulminic acid.

The Asymmetric Methyl Dialkylisoureas:

RALPH H. MCKEE, Lake Forest University.

The isoureas of this series, $Alk_2N-COCH_3=NH$, were prepared by the action of methyl alcohol on the dialkylcyanamide in the presence of sodium methylate. They are strongly basic oils whose water solutions act similarly to ammonia on silver, mercuric and mercurous salts, but are unlike ammonia in that they do not affect copper or cobalt hydroxides. Decomposition of the dry hydrochlorides, or their solutions in water, gives methyl chloride and the urea ($Alk_2N-CO-NH_2$) quantitatively. These isoureas readily condense with phenyl isocyanate, benzoyl chloride, etc., but are not affected by benzaldehyde, ethyl oxalate or ethyl malonate.

Melting Points of Binary Mixtures of Ortho-Meta and Paranitraniline—A New Method for the Determination of these Compounds: J. BISHOP TINGLE and H. F. ROLKER.

Binary mixtures of the three nitranilines have been made in steps of 2 per cent., and the melting points of these mixtures have been plotted against the composition. The curves given by the ortho-meta and meta-

para-mixtures are very smooth and of the same type; they rise regularly on each side of the entectic point to the melting point of the pure isomer. These curves are used for the determination of mixtures of unknown composition in the following manner: The substance under examination is divided into two portions, one of which is termed *A*; the other portion is mixed with a quantity of one of the pure isomers—say the meta compound, and is termed *A1*. The melting points of *A* and *A1* are determined simultaneously. That of *A* corresponds to a position on each of the two branches of the curve. If the m.p. of *A1* is lower than that of *A* the composition of the latter corresponds to the temperature marked on the ortho-branch of the curve, otherwise to that on the meta-branch. The curve given by mixtures of ortho- and paranitraniline is highly irregular and an attempt is being made to ascertain the reason for this.

Intramolecular Condensation in the Phthalanilic Acid Series: J. BISHOP TINGLE and H. F. ROLKER.

The work of Bishop Tingle and Cram⁴ and Bishop Tingle and Lovelace⁵ on this subject is being continued. Acids of the series RNH differ markedly in stability towards increase of temperature, and reactivity with amine as the group R varies. In some cases the action on an amine R, N.H₂ causes the formation of an amide; in others R is substituted by R, while with some acids substituted diamides are produced. Phthalanilic acid is stable in boiling aqueous solution, but in presence of a small quantity of aniline it is quickly converted into phthalanil. The action of alcohol on these acids has also been studied and a suggestion is made as to the cause of its "dehydrating" power in this case and in others.

⁴ *Amer. Chem. Journal*, **37**, 598 (1907).

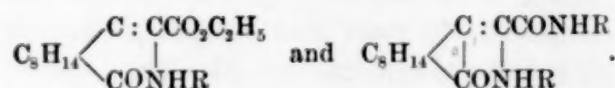
⁵ *Ibid.*, **38**, 642 (1907).

The Clarsen Reaction: J. BISHOP TINGLE and ERNEST E. GORSLINE.

The authors' investigation of the mechanism of the Clarsen reaction and of the part played in it by ether and other catalytic agents such as quinoline and pyridine is being continued and extended so as to determine the influence on the condensation of ketones and esters of varying constitution. The results obtained so far are wholly incompatible with the Clarsen theory regarding the mechanism of the reaction, but are in excellent accord with that of Michael except in so far as it necessarily fails to take account of the influence of the ether, etc. An explanation is offered of the activity of the catalysis mentioned above. Evidence is being accumulated which tends to show that during the course of the Clarsen reaction at least two and possibly more different series of reactions take place side by side leading to quite dissimilar end-products.

Action of Amines on Ethyl Camphoroxalate: J. BISHOP TINGLE and L. F. WILLIAMS.

It has been shown by Bishop Tingle and Alfred Tingle⁶ that ethyl camphoroxalate and amines yield compounds of the types



The ability to form one or other of these derivatives depends: (1) on the nature of the amine; (2) on the experimental conditions. A systematic investigation of the influence of these two factors is now in progress.

Studies in Catalysis—The Formation of Guanidines: JULIUS STIEGLITZ.

Ammonia acting on urea esters gives only very small yields of guanidines. The author's theory of the catalytic action of

⁶ *Amer. Chem. Journal*, **21**, 256 (1899); **23**, 226 (1900).

acids (Congress of Arts and Science, St. Louis, IV., 278 (1904), *Am. Chem. Jour.*, January, 1907, etc.) suggested that probably the real reacting component is the positive urea ester ion and that the addition of an acid to the mixture would, by facilitating the ionization of the urea ester, lead to a perfect method of synthesis. Preparative as well as quantitative experiments carried out with Dr. R. H. Hall completely confirmed this view and brought, therefore, one more experimental confirmation of the theory of catalysis underlying the author's work.

The Oxidation of M-Nitrobenzoylcarbinol:

WM. L. EVANS and BENJ. T. BROOKS.

When benzoylcarbinol is acted upon by oxidizing agents it is found that there is obtained varying amounts of benzoylformaldehyde, mandelic, benzoylformic and benzoic acids, according to the agent used. Preliminary experiments, the results of which are herewith presented, are being conducted to determine the following points:

1. Are the same general reactions followed in the oxidation of these simple substituted sugars, like m-nitrobenzoylcarbinol, as were developed for benzoylcarbinol?

2. And also, what possible effect might introducing substituents into the ring have on the behavior of these substances towards oxidizing agents which were previously used with benzoylcarbinol?

The following results were obtained: (1) m-nitrobenzoylcarbinol gives with freshly precipitated mercuric oxide, freshly precipitated silver oxide and potassium permanganate alone or in the presence of alkalies, benzoic acid and carbonic acid exclusively; (2) m-nitrobenzoylcarbinol gives with cupric hydroxide and caustic alkalies only m-nitromandelic acid; (3) m-nitrobenzoylcarbinol gives with potas-

sium ferri-cyanide and alkalies both m-nitrobenzoic acid and m-nitromandelic acid.

Thus far, these preliminary experiments seem to follow the general interpretation previously given by one of us for the reactions of benzoylcarbinol.

A Chemical Study of a Number of the Wild Fruits from Sylvan Beach, N. Y.:
NICHOLAS KNIGHT.

The territory was formerly the lake bottom, and the soil is of so sandy a nature that it is unfit for purposes of agriculture. The fruit of the *Smilacina racemosa* and *Smilacina ffolia* were first investigated. It was necessary to pick the former while still green and to allow it to ripen slowly on the stems while under cover. Later on opportunity was presented for analyzing the fully ripened fruit that had matured normally. A glucoside in the fruit picked green changed to tannic acid in the ripe berries. In other respects the fruit of the earlier and later picking bore a striking resemblance, as likewise the fruits of the two species. The fruit of *Solanum dulcamara* from the same locality was also reported on.

Bromination of Phenyl and Tolyl Ethers:
ALFRED N. COOK.

Phenyl ether yields a dibrom and tetrabrom derivative with iodine as a carrier. Ortho-, meta- and para tolyl ethers yield di- and tetrabrom derivative also with iodine as a carrier, as *per se*. The bromine evidently enters the nucleus even when heated to 150° C., and in direct sunlight, as indicated by the fact that the derivatives do not react with caustic potash, sodium carbonate or calcium carbonate and water even when heated under pressure. This is contrary to the well-known law. The halogen usually enters the side chain and not the nucleus in direct sunlight or at elevated temperatures.

Mesoxalic Esters and their Reaction with Hydrazin: RICHARD S. CURTISS and P. T. TARNOWSKI.

Methylmesoxalate may be obtained by saturating methylmalonate at 0° with N_2O_3 . After forty-eight hours it is distilled in vacuo. A yield of 80–85 per cent. of $(HO)_2C = (COOCH_3)_2$ can be crystallized from the oily distillate. Hydrazin hydrate and carbonate solutions react with $OC = (COOH)$, forming gummy and resinous polymerization products. With carefully chosen conditions both the methyl and ethyl esters give white crystalline bodies.

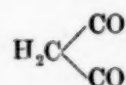
Owing to the ease of dissociation into hydrazin and mesoxalic esters, the question of an asymmetrical or a symmetrical hydrazin derivative was not settled. PCl_5 proves hydroxyl groups present. Benzaldehydyl yields benzalazin and mesoxalic ester. Benzoyl chloride gives symmetrical dibenzoyl hydrazin. Acids and alcoholic solutions dissociate these derivatives into hydrazin and ester.

Nitrosomalonic Esters: RICHARD S. CURTISS.

The action of N_2O_3 on malonic esters at low temperatures forms a number of unstable nitrogen derivatives. From the green oils thus obtained with ethyl malonate two potassium salts have been obtained: one (β) canary yellow, the other (α) nearly colorless. The molecular weight and potassium determinations show them to be salts of ethyl nitrosomalonate. The unstable nitroso ester formed by dilute acids on the salt is pale green; stains the cuticle like nitric acid; gives off nitrogen oxides in a desiccator, and is entirely different in its properties from the oxime of mesoxalic ester $HON = C = (CO_2CO_2H)_2$. Saponification of the salt with alcoholic potash yields a chrome yellow potassium salt, which when treated

with dilute H_2SO_4 and ether gives a yellow oil not at all like the stable crystalline oxime, $HON = C = (CO_2H)_2$. It is in fact extremely unstable. When air is allowed to enter the desiccator, after its ethereal solution has been freed of ethyl in vacuo, it heats up, liberates gases and puffs off white vapor, then flashes into flame, and leaves the desiccator filled with dense clouds of red oxides of nitrogen.

The study of these compounds as well as other nitroso and nitro derivatives of the group

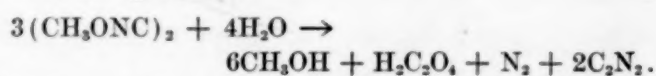


is in progress.

A Peculiar Decomposition of the Esters of Formylchloridoxime: H. C. BIDDLE.

In the action of caustic potash on methyl formylchloridoxime there are formed methyl cyaniminocarbonic and diiminooxalic esters, nitrogen, and the potassium salts of hydrocyanic, cyanic and oxalic acids.

The methyl fulminate naturally expected is not obtained. If formed at all, the fulminic ester probably condenses to the double molecule, which then dissociates in two directions, in one case giving rise to oxalic acid and methyl alcohol and in the other to cyanogen and alcohol, according to the equation:



The occurrence of cyaniminocarbonic and diiminooxalic esters is readily explained by the tendency of cyanogen to absorb alcohol in the presence of an alkali.

The Constitution of Indigos and Related Compounds: M. T. BOGERT, K. G. FOLK and J. M. NELSON.

Some recent work on indigos (chromophore $CO \cdot \dot{C} : \dot{C} \cdot CO$) is discussed on the hypothesis of the different colors being due

to differences in spatial configuration. The possibility of applying a similar explanation to compounds similarly constituted containing the grouping $\cdot\text{CO}\cdot\text{C}:\text{C}$, and also to some dibenzalacetone derivatives $\cdot\dot{\text{C}}:\dot{\text{C}}\cdot\text{CO}\cdot\dot{\text{C}}:\dot{\text{C}}$, is referred to.

Phenylmalonic Nitrile: JOHN C. HESSLER.

The silver salt of phenylmalonic nitrile is hydrolyzed almost immediately after its preparation, giving dimolecular and trimolecular phenylmalonic nitrile, as well as an oxidation product of unknown molecular weight. Phenylmalonic nitrile and the two polymers give this oxidation product when treated with chromic acid. The sodium salt of phenylmalonic nitrile gives the same substance when treated with bromine.

Dimolecular phenylmalonic nitrile gives a sodium salt and a silver salt. The silver salt reacts with alkyl iodides to give alkyl dimolecular phenylmalonic nitriles.

The Catalysis of Imido Esters by Alkalies: HERMAN I. SCHLESINGER.

The parallel behavior of ordinary acid esters and acid imido esters when catalyzed by acids, as brought out by Herty and his collaborators, is found also in their behavior towards alkalies. Imido esters were found to be catalyzed with a velocity proportional to the concentration of the hydroxyl ion.

The Action of Alkalies on the Carbohydrates: J. U. NEFF. Reported by title.

Marrubiin: H. M. GORDIN. Reported by title.

Imido-hydantoin: JAMES B. GARNER. Reported by title.

On the Salts of Tautomeric Compounds: S. F. ACRER, R. F. BRUNEL, J. M. JOHNSON, G. H. SHADINGER and SIDNEY NIRDLINGER. Reported by title.

The Hydrocarbons in the Lignites of the Northwest: G. B. FRANKFORTER. Reported by title.

Some Halides of Pinene: G. B. FRANKFORTER and WALTER BADGER. Reported by title.

INDUSTRIAL CHEMISTRY SECTION

W. H. ELLIS, Chairman

The Use of Carbon Tetrachloride as an Extractive in Commercial Analyses of Cotton-seed Meal: CHAS. H. HERTY and F. B. STEM.

Carbon tetrachloride has been found to be an excellent extractive of cotton seed oil from the meal. As a substitute for the Soxhlet apparatus for extraction a simpler method is recommended. The meal is allowed to stand in contact with a definite volume of the extractive in an Erlenmeyer flask. One half of the extractive is then filtered off, the percentage of oil being determined in this filtrate from the weight of the residual oil after evaporation of the extractive. By extracting at 70° C. it is possible to get a complete extraction in 3¼ minutes.

The Volatile Oils of Pinus Tæda and of Pinus echinata: CHAS. H. HERTY and W. S. DICKSON.

The volatile oils distilled from specimens of the oleo-resins of *Pinus Tæda* (loblolly pine) and *Pinus echinata* (shortleaf pine) collected near Chapel Hill, N. C., have been studied. The results show these to be practically identical with the volatile oils of the more common long-leaf pine and Cuban pine. The chief constituent of each is pinene.

A New Oxidizing Medium and its Function in the Blood and Muscle Elements: J. E. SIEBEL.

¹ This paper was placed in the industrial section under the title of "A New Oxidizing Agent." The

Experiments are quoted showing that alkaline bicarbonates may exchange carbonic acid for oxygen, which latter is thereby converted into an active modification, thereby enabling such bicarbonate solution to be used for oxidizing purposes, notably also as the negative element in electric batteries constructed by the author in which sugar, oleates, alcohol and other nutrient combustibles are oxidized, yielding a full equivalent of electricity without dissipation of energy. It also appears that alkaline carbonates present in the serous liquids of the human system act as a transmitter of oxygen from the oxyhemoglobin of the red corpuscles to the oxidable matter in the muscle elements, thereby activating or transferring the oxygen into the active modification.

As foreshadowed in a paper on electrodynamics of nutrition read at the former meeting, it is shown that the sarcois elements of the contractile disks of the voluntary muscle fiber represent the electrodes of batteries in which nutrients or their derivatives are oxidized by the active oxygen transferred to them by the bicarbonates, thereby causing contraction by the mutual attraction of the parallel electric currents regulated by simple contrivances fully explaining the interior mechanism of the concert action of voluntary muscles, nerves and nerve centers. Calculations are presented showing that currents of very low voltage and amperage suffice for these performances.

It is also found that the order in which, according to Atwater, different substances are preferred and replace each other in nutrition, viz., alcohol, sugar, fat, proteids, is the same as that in which they furnish the greatest amount of electromotive force in batteries constructed by the author in analogy to the supposed muscle batteries.

author subsequently added some biochemical data and presented it before the section.

Wood Turpentine and their Relation to Gum Turpentine: W. C. Geer. Reported by title.

The Deposition of Arsenic upon the Vegetation of Smelter Regions: W. D. HARKINS. Reported by title.

Determination of Small Quantities of Monocarbonate in Bicarbonate of Soda: J. D. PENNOCK and D. A. MORTON. Abstract misplaced.

The Criteria of Deterioration in Flesh Foods: W. D. RICHARDSON. Reported by title.

Transparent Soot: a Supercooled Solution: W. D. RICHARDSON. Reported by title.

Examination of Crude Petroleum for Comparative Purposes: DAVID T. DAY. Reported by title.

Long-leaf Pine Oil: J. E. TEEPLE. Reported by title.

Microscopic Detection of Free Magnesia in Portland Cement: ALFRED H. WHITE. Reported by title.

Analysis of Turpentine by Fractional Distillation with Steam: W. C. GEER. Reported by title.

BIOLOGICAL CHEMICAL SECTION IN JOINT
SESSION WITH AMERICAN SOCIETY OF
BIOLOGICAL CHEMISTS

R. H. Chittenden, chairman and president Organic Soil Constituent: OSWALD SCHREINER and EDMUND C. SHOREY.

The authors reported on a crystalline organic compound which had been isolated from several unproductive soils. The compound when tested by physiological methods is harmful to plants and appears to be the cause of the unproductivity in these soils. It can be obtained by extracting the soil with dilute soda solution, acidifying, filtering from the voluminous precipitate of humus bodies produced and

shaking the filtrate with ether. The ethereal solution contains the compound, and this is obtained in a crystalline form by evaporating the ether over water. When pure, the compound is white, melts at 98-99° and has the composition and other properties of dioxystearic acid prepared by oxidation of elaidic acid.

Toxic Substances Arising During Plant Metabolism: OSWALD SCHREINER and M. X. SULLIVAN.

For the purpose of studying the factors underlying the decrease in yield of plants grown successively on the same soil, wheat and cowpea were grown on different soils until the yield of the plants became poor. Water extracts of these soils proved to be poor media for the respective plants. On shaking the extract with carbon black and filtering, they became far better media for plant growth. It must be concluded then that the soil extracts contained something actually deleterious to the plant since the carbon black made from natural gas acts merely as an absorbing agent.

From wheat-sick soil there was obtained by steam distillation a crystalline body which is toxic to wheat. From cowpea-sick soil in the same manner a crystalline body was obtained which is toxic to cowpea but not to wheat.

The Chemical and the Physiological Properties of a Solution of Hydrochloric Acid and Sodium Chloride: AMOS W. PETERS.

The influence of neutral salts, *e. g.*, NaCl, extends to both chemical properties of solutions and to correlated physiological functions. The killing concentration of HCl for protozoa is lowered by the addition of a concentration of NaCl which is practically harmless when used alone. This effect can be explained by the increased acidity of the mixed solution, according to Arndt, Euler and others.

Colorimetric comparisons with methyl orange, and inversion tests by the polarimetric method, made with the dilute solutions of these experiments, favored this hypothesis, whether the solutions were made with redistilled water or with the original culture liquids. The increased velocity of inversion due to NaCl disappeared when the acid products of the reaction demonstrated by Kullgren increased.

The Endo and Ekto-invertase of the Date: A. E. VINSON.

The invertase of the date remains insoluble in all ordinary solvents throughout its green stages, but becomes readily soluble on ripening. The change in the behavior of the invertase toward solvents coincides very closely in point of time with the passage of the tannin into the insoluble form. Tannin in relatively large amounts does not retard the action of date invertase either in the extract or in the pulp. Soluble tannin, however, hinders the solution of date invertase in water, but the invertase can be extracted by glycerine, provided the glycerine is added at the same time the tannin is added. Green date invertase can not be extracted by crushing and macerating the green fruit with glycerine, therefore the invertase is not rendered insoluble, under the conditions of the experiment, by the escape of soluble tannin on crushing the tannin cells. This conclusion is confirmed by the behavior of the invertase in the tannin-free portion of the date after the tannin-bearing tissues have been completely removed. There is no direct connection between the change in the state of the tannin and that of the invertase.

The inversion of cane sugar by the green date pulp is not accomplished by the living protoplasm liberating a soluble ferment from a preexisting insoluble zymogen or

by rendering active a proferment. The rate of inversion by equivalent amounts of green and ripe pulp of the same variety are practically identical. Protoplasmic poisons—picric acid, chromic acid and formalin—retard the action of green and ripe pulp, but to approximately the same degree. If the living protoplasm were in any way connected with the inversion, the retardation would be greatly intensified in the presence of protoplasmic poisons. Green date tissue is not rendered inactive by soaking in ether, chloroform, acetone, etc.

The press juices of the green date contain most of the water in the fruit and large amounts of soluble substances which are usually retained by the healthy and unbroken semipermeable *hautschicht*. These juices and extracts are invariably free from invertase until the fruit ripens, although the press residues are always very active.

Treatment of the tannin-free green date tissue with chloroform, ether, toluol and acetone does not alter the behavior of the invertase towards solvents. Moreover the invertase is not liberated by heat. This treatment should destroy the semipermeable nature of the protoplasmic wall. From these observations the theory of the impermeability of the cell wall for the invertase of green date is untenable.

Enzymic action will take place whenever either enzyme or material to be acted upon is soluble; that is, molecular contact must be established. Tannin removes the invertase of ripe dates from solution, but inversion is not checked unless the precipitate is filtered off. Date extracts precipitated by lead subacetate still invert cane sugar, but on removing the precipitate inversion is stopped. It is thus possible to invert sugar by means of invertase artificially rendered insoluble.

In the place of impermeability of the

cell wall to the enzyme, the writer proposes the following theory. It is highly probable that green date invertase and possibly other endoenzymes are held in an insoluble combination by some constituent of the protoplasm. In some cases this combination may be broken down and the enzyme pass into solution while the protoplasm is living, but in others the combination may persist even after the death of the protoplasm. The enzyme may be rendered soluble also by external chemical or physical influence. On maturity of the tissues the enzyme is generally liberated, possibly by autodigestion or other profound change in the protoplasm.

In order to establish the impermeability of the cell wall to the enzyme in any given case it must be shown that the enzyme is in solution in the cell sap and not held in combination by the protoplasm.

On the Occurrence of a Phytin-splitting Enzyme in Animal Tissues: E. V. McCOLLUM and E. B. HART, Chemical Laboratory of the Wisconsin Experiment Station.

The authors have examined the influence of blood and of water and glycerine extracts of liver, kidney and muscle upon the sodium salt of anhydroxymethylenediphosphoric or phytic acid prepared from wheat bran. The sodium phytate was digested at 40° C. for one or two days with blood and with the tissue extracts, and the phosphoric acid in the mixture estimated by the method of Hart and Andrews^{*} for determining inorganic phosphoric acid in the presence of phytin. These values were compared with those obtained with blood and the extracts alone. The results indicate that blood and the liver of calves possess the power of cleaving sodium phytate with the formation of phosphoric acid. Muscle and kidney as well as the enzymes of the digestive tract do not alter phytin.

^{*} *Amer. Chem. Journal*, 30, 470 (1903).

Bacterial Growth and Chemical Changes in Milk kept at Low Temperatures: M. E. PENNINGTON, United States Department of Agriculture, Bureau of Chemistry.

Bacteria in milk increased in numbers at a temperature of -0.55°C . Bacterial growth at the end of a week was pronounced. There was a steady increase in the number of organisms for five or six weeks and at their maximum they numbered hundreds of millions. Occasionally they passed the billion mark per cubic centimeter. This occurred in spite of the fact that, though the milk was never solidly frozen, after ten days to two weeks it was a mass of small ice crystals. Neither odor nor taste indicated the high bacterial content and a curd was not produced even on heating, until the very end of the experiment.

There were present at all times during these experiments acid-forming, liquefying and neutral organisms. Acid formers were in lower and the liquefying organisms in higher proportion than is commonly found. Certain species, such as *B. formosus*, *B. solitarius* and *B. Ravenel*, were especially resistant to cold and frequently were the predominating species, or almost in pure culture at the end of the experiment.

Storage at this temperature ordinarily cuts down the number of organisms developing at 37°C ., the maximum number being found when the plates were kept at 20° or 0°C . The acidity increases to such an extent that sometimes 100 c.c. of N/10 sodium hydrate are required to neutralize 100 c.c. of milk, but this acidity has not caused a curd.

A chemical study of the proteid of milk in cold storage showed that the casein was rapidly digested, until finally more than 30 per cent. of it was changed to soluble compounds. Caseoses, amido acid and, probably, peptones increase, apparently at

the expense of the digested casein. The rapidity with which this digestion takes place varies in different samples, but at the expiration of two weeks it is pronounced.

A Demonstration of a Method (with apparatus) of showing the Electric Charge of Colloids: A. B. MACALLUM. Reported by title.

On the Action of Nitric Acid on Nucleic Acids: WALTER JONES. Reported by title.

The Improbability of a Radiotropic Response: C. STUART GAGER. Reported by title.

Glycocol as a Product of Uricolysis: LYMAN B. STOOKEY. Reported by title.

A Study of the Influence of Potassium Cyanide on the Excretion of Nitrogenous Substances in the Urine of Dogs: WILLIAM H. WALKER. Reported by title.

Transmitted by Charles L. Parsons, secretary of Section C.

B. E. CURRY,
Press Secretary

NEW HAMPSHIRE COLLEGE

THE AMERICAN CHEMICAL SOCIETY CHICAGO MEETING

THE meeting of the American Chemical Society in Chicago was attended by some 350 chemists and was one of the most successful in its history. One hundred and thirty papers were presented at the meeting, including several important addresses of general interest, which required the society to meet in six subsections.

The reelection of Marston T. Bogert as president was announced and of H. P. Talbot, Louis Kahlenberg, A. E. Leach, Wm. D. Richardson and W. Lash Miller as councilors at large.

The meeting was marked by enthusiasm throughout and the announcement that the

society had gained several hundred new members this last year and was on a continued upward growth was pleasing to all.

The most important action taken at the meeting was the decision to organize a Division of Industrial Chemists and Chemical Engineers who shall elect their own officers, and to begin the publication of the *Journal of Industrial and Engineering Chemistry* with a board of editors carefully picked as experts in the several lines of chemical industry.

The publication of *Chemical Abstracts*, which is now beginning its second volume, has been a very great benefit to the society and remarks of approval were heard on all sides. It has published this last year 7,975 abstracts, covering 3,047 pages, and abstracting over four hundred journals. Its influence is widely felt in the present prosperity of the society.

It is hoped that by this large union of American chemists the great duplication of effort which has been characteristic of foreign journals will be avoided in America and that the members of the American Chemical Society can be given for a minimum cost literature which will cover almost the entire field of chemistry.

Excursions, banquet, smoker and social functions were largely attended and every member present went home with the determination that he would be at the next meeting.

CHARLES L. PARSONS,
Secretary

THE BOTANICAL SOCIETY OF AMERICA¹

THE second annual meeting of the federated societies (the fourteenth of the Botanical Society of America) was held in Hull Botanical Laboratory, at the University of Chicago, December 31, 1907, to

¹ A union of the Botanical Society of America, the Society for Plant Morphology and Physiology and the American Mycological Society.

January 3, 1908, under the presidency of Professor G. F. Atkinson. About fifty members were in attendance at the meeting, which was thoroughly interesting throughout. The excellent arrangements made by the members of the local committee and by the staff of the department of botany of the University of Chicago, contributed largely to the success of the meeting.

The officers elected for 1908 were:

President—Professor W. F. Ganong, Smith College.

Vice-president—Dr. C. L. Shear, Bureau of Plant Industry.

Treasurer—Dr. Arthur Hollick, New York Botanical Garden.

Secretary—Professor D. S. Johnson, Johns Hopkins University.

Councilors—Professor W. G. Farlow, Harvard University (one year); Professor J. M. Coulter, University of Chicago (two years), and Professor W. Trelease, Missouri Botanical Garden (three years).

Three associate members were elected to full membership and three botanists were elected to associate membership.

The Committee on the College Entrance Option, Professor W. F. Ganong and F. E. Lloyd, made a report, of which, because of its general interest, an abstract is printed here:

The report outlines the work of the committee from its appointment in December, 1900, to the present. The high school course formulated by the committee, on the basis of the reports of the National Educational Association and after wide consultation with prominent teachers throughout the country, is now used as a basis for its examinations by the College Entrance Examination Board, and is given by a considerable number of preparatory schools. The committee recommended (a) that it be enlarged somewhat in numbers and scope, to become a standing committee on education, of three members, having charge of this option and such other educational

matters as may be referred to it by the society; (b) that a fourth edition of its course with appropriate accessory matter be printed at the expense of the society for wide circulation; (c) that it be authorized to cooperate with a similar committee of the American Society of Zoologists in formulating a high school course in biology. The committee further recommended (d) that all members of the society engaged in college or university work be requested to call the attention of their respective faculties to the fact that college entrance examinations are now being held every June in all the principal centers of the country in a year's thorough course in botany, a course ample to count as one point out of fourteen or fifteen for entrance. It seems desirable for all the interests concerned, the colleges, the schools and the science, that this course should be accepted as an option for entrance by all colleges. The recommendations were all adopted by the society.

The next annual meeting will be held in conjunction with the American Association for the Advancement of Science.

An important feature of the program was the session devoted to a symposium on "Aspects of the Species Question." Six twenty-minute papers were read, by C. E. Bessey, N. L. Britton, J. C. Arthur, D. T. MacDougal, F. E. Clements and H. C. Cowles, and these were followed by an hour's general discussion. These papers will be published soon in *SCIENCE*. The remaining scientific sessions were devoted to the reading of botanical papers, of which abstracts follow:

The Foot in Bryophytes: Professor C. R. BARNES and Dr. W. J. G. LAND, University of Chicago.

Cell Lineage in Fern Roots: Professor H. S. CONARD, Iowa College, Grinnell, Iowa.

Lateral segments of the initial cell of homosporous leptosporangiates are not di-

vided in the sequence described in German, English and American text-books. On the contrary, the first division is periclinal, and the second and third walls divide the segment into sextants. The fourth wall is periclinal, and lies ultimately between pericycle and endodermis. An attempt was made to determine whether the serial arrangement of rhizogenous cells in cyatheaceous ferns is a trustworthy ordinal character. The series is found to be so much interrupted in *Alsophila australis* as to be of very doubtful taxonomic value.

Report on Dioon and Ceratozamia: Professor C. J. CHAMBERLAIN, University of Chicago.

The life history of *Dioon edule* has been studied and a paper dealing with the ovule and female gametophyte has been published. A second paper, which will be published soon, contains a cytological study of the development of the blepharoplast and sperm, an account of fertilization and a study of the embryogeny of *Dioon edule*. The latter is peculiar and may throw some light upon the origin of the free nuclear condition of gymnosperm embryos.

Dioon spinulosum is more primitive than *D. edule* and may show some Bennettitales characters.

A preliminary survey of *Ceratozamia* shows that the blepharoplast is the largest yet discovered, that there are sometimes more than two sperms, and that the embryo develops very slowly, so that it may be little beyond the free nuclear condition when the cone begins to decay. There is only one cotyledon. As in *Dioon*, the seed does not necessarily pass into the resting condition, but growth may be continuous from fertilization up to the leafy plant.

The field study, which is still very incomplete, shows that there are probably only two species of *Dioon*, the confusion having arisen from the fact that the plants

present strikingly different characters at different stages in the development of the individual.

A Unicellular Marine Brown Alga: Dr. G. T. MOORE, Marine Biological Laboratory. (By title.)

The Cytology of the Male Gametophyte of Polytrichum juniperinum: Professor C. E. ALLEN, University of Wisconsin.

The chromosome number in somatic and spermatogenous cells is six. In vegetative divisions an aggregation of cytoplasmic materials, but no definite body of kinoplasmic or centrosomal nature, appears in the region of the spindle poles.

In the early spermatogenous divisions, a dark-staining plate appears at each pole; fibers connect the two plates, forming a broad-poled spindle. These plates persist during the division.

In later divisions appears a group of bodies similar to the "chromidial filaments" of animal cells. The group divides into two, which separate from one another and pass to the poles of the future spindle.

In one or more of the latest spermatogenous divisions, probably only in the last, a dark-staining granule, surrounded by astral radiations, appears in the cytoplasm near the nucleus. This divides into two granules, which separate and, each with its aster, pass to opposite sides of the cell. A spindle is formed between the two granules, the nuclear membrane disappears, and nuclear and cell division completed. After the formation of the spindle, the polar radiations disappear; the polar granules become less distinct, but are sometimes seen as late as the telophases. Cell division is in all cases by means of a cell-plate.

After the last division, the cell walls are dissolved and the cells round up. Each now contains, besides the nucleus, a long rod (the blepharoplast) lying just inside the plasma membrane, and a large dark-

staining body, which becomes constricted into two (bodies *a* and *b*). The nucleus becomes applied closely to the blepharoplast, pushes out a beak toward one end of the latter (the anterior end), and elongates gradually into a slender spiral of about one and one half turns. After the early stages the blepharoplast can not be distinguished, except that its anterior end seems to extend a short distance beyond the nucleus. The two cilia grow out from this portion of the blepharoplast. Body *a* becomes applied closely to the anterior end of the blepharoplast, persisting to a very late stage. It may give rise to a slight swelling at the anterior end of the mature antherozoid. Body *b* becomes attached to the posterior portion of the nucleus and persists, forming the "vesicle" which is for a time attached to the mature antherozoid.

Apogamy in Nephrodium: Dr. S. YAMANOUCHI, University of Chicago. (By invitation.)

The nuclear condition in *Nephrodium molle* may be summarized as follows:

1. The nuclei of the prothallia contain 64 or 66 chromosomes, the x number, and the nuclei of the gametes contain the same number. The fusion nucleus in the fertilized egg presents 128 or 132 chromosomes, the $2x$ number, which remains unchanged until it is reduced during sporogenesis. Consequently, in the normal life history of *Nephrodium* the gametophyte generation contains the x number of chromosomes and the sporophyte generation the $2x$ number.

2. The nucleus of a prothallial cell with the x number of chromosomes (64 or 66) sometimes become directly the nucleus of a sporophyte, apogamously produced; so that the x number of chromosomes continues through the whole life history of the apogamous sporophyte. This fact does not seem necessarily to affect the fundamental idea that the alternation of generations is marked by the difference in the number of

chromosomes in the normal life history; it is simply an abnormal case of secondary importance. Still it must be admitted that in the case of apogamy, at least, the number of chromosomes is not the only factor which determines the character of the sporophyte and gametophyte.

Further Studies on the Chromosomes of Enothera: Dr. R. R. GATES, University of Chicago. (By invitation.)

On account of the well-known variation in chromosome numbers in root-tips, it was important that the chromosomes of *O. gigas* should be counted in the germ cells. The pollen mother cells of *O. gigas* have 28 chromosomes, the reduced number being 14. In rare cases one chromosome passes to the wrong pole of the heterotypic spindle, making the numbers in the daughter nuclei 15 and 13.

This mutant is rare, having appeared only four times in all cultures, only two of these four maturing seeds. It is larger in all its parts than the parent form, and this is found to be due to the larger size of the cells. The leaves, however, are more like *O. lata* than *O. Lamarckiana*. Whether the only primary change, in the production of *O. gigas*, was the doubling of the number of chromosomes, from which resulted the larger cells and hence the larger size of the organs, or whether this is but a part of the original change, can not be determined at the present time.

Evidently all the mutants do not originate in the same way.

O. lata × *O. gigas* has 21 chromosomes (one plant 20), and in reduction ten are regularly segregated from eleven. Two kinds of germ cells are thus produced. Occasionally one chromosome passes to the wrong pole of the spindle, making the reduced numbers nine and twelve. The same irregularity in the germ cells occurs in all the other hybrids examined, and, more rarely, in several of the pure forms.

The deviations of one or two from the normal somatic count, which have been observed in several of the forms, are thus simply and easily explained.

Chromosomes of the Somatic Cells of the Enotheras: Miss ANNE M. LUTZ, Station for Experimental Evolution. (By invitation.)

Root tips of pedigreed plants were used exclusively for these studies and a number of forms were reported upon at the Seventh International Zoological Congress (*Amer. Nat.*, October, 1907).

Enothera lata (self-pollinated), *O. oblonga* and *O. nanella* had been only hastily examined at the time of the first report, but all have since been carefully studied. The evidence for *O. lata* is not conclusive; 15 chromosomes have been counted, 14, and also apparently 16.

Of the three plants of *O. oblonga* which arose from Dr. D. T. MacDougal's self-pollinated *O. lata* (original seed from England), one showed 14 chromosomes and the remaining two 15 each in every root tip studied.

Three plants of *O. nanella* (seed from Holland, pure bred about 15 generations) gave 14 chromosomes each in *A* and *B* and 15 in *C* in every countable figure.

Mr. R. R. Gates has reported the sporophyte number of chromosomes for plants said to be *lamarckiana* arising from a cross between *O. lata* ♀ and *O. lamarckiana* ♂ to be about 20 (*SCIENCE*, February 15, 1907; *Bot. Gaz.*, February and July, 1907). Of the seven offspring of a similar cross which were identified as *O. lamarckiana*, I have found each plant to have 14 chromosomes in the cells of the root tips. Two seedlings of *O. albida* arising from this cross had each 15.

Effects of Exposing Germ Cells to the Rays of Radium: Dr. C. S. GAGER, New York Botanical Garden.

At the 1907 meeting of Section G of the American Association for the Advancement of Science I announced that certain results had been obtained by exposing egg and sperm cells of *Onagra biennis* to radium rays, and that these effects were character changes that gave promise, if inherited, of being of specific value. During the past summer these plants matured, and seed has been gathered for the F_2 generation. Results in the F_1 generation were in part as follows:

1. *Functional Asymmetry*.—One side of the plants grew faster and more vigorously than the other, though subjected to perfectly uniform environmental conditions.

2. *Morphological Asymmetry*.—On one side the leaves possess the characteristics, not of the typical *O. biennis*, but of one of its mutants.

3. *A Plant having Two Shoot Systems on One Root*.—One of these systems possessed the characteristics of the typical *biennis*, the other of one of its mutant derivatives. This plant, and the morphologically asymmetrical ones described above, and interpreted as probably sectorial bud-sports, indicate a fundamentally hybrid nature of the plants thus sporting. The characters of the two diverse parents separate out in the bud-sporting, and the parental characters of one of the parents have never found expression in a mature ancestor in the direct line, but have existed only potentially in the parental gamete.

Effects of Radium Rays on Mitoses: Dr. C. S. GAGER, New York Botanical Garden.

Root tips of *Allium cepa* were exposed for various lengths of time to rays from radium bromide contained in sealed glass tubes. Exposure was made by placing these tubes close to, but not touching, the roots growing from bulbs in a moist chamber. Thus the α rays were eliminated, only the β and γ rays being able to pass easily

through the walls of the glass tube. For purposes of comparison control (unexposed) tips, grown under precisely similar conditions, except for the absence of the rays, were collected at the same time as those exposed.

Examination showed various irregularities in the mitoses in roots exposed to the rays. Exposure to the strongest radium (1,500,000 activity) for a given period completely inhibited nuclear division. With less active preparations and varying lengths of exposure there resulted various disturbances to the chromosomes, some of them lagging behind in the passage from the equator to the poles of the spindle. At times some of the chromosomes appeared to have been accelerated in their passage, even having gone beyond the poles. It was frequently observed that some of the chromosomes failed entirely to pass to the poles, and, consequently, were not included in the formation of the daughter nuclei. This elimination of chromatin from the daughter cells may explain morphological changes in a zygote, following exposure of the fusing gametes to the rays. In one instance the daughter nuclei have apparently separated into two distinct parts, roughly giving the appearance of two nuclei in each daughter cell.

The Relation of Bursa Heegeri to Bursa bursa-pastoris: Dr. G. H. SHULL, Station for Experimental Evolution.

Before the beginning of my experiments *Bursa Heegeri* was known with but one type of rosette, apparently agreeing with one of the elementary forms of *Bursa bursa-pastoris* which I had previously shown to possess two dominant Mendelian units in the lobing of its leaves. Upon crossing *B. Heegeri* with that form of *B. bursa-pastoris* which had the corresponding recessive characters, the second generation showed the same four types of rosette, previously secured in a cross between the

two corresponding elementary forms of *B. bursa-pastoris*, and appearing just as in that case in the ratio, $9AB:3aB:3Ab:1ab$. This ratio appeared in combination with each type of capsule, so that *B. Heegeri* now exists with four types of rosette.

The form of capsule is a perfectly alternative character, but the F_2 hybrids have the *Heegeri* type of capsule in only one in 18 to 25 individuals.

The fact that *B. Heegeri* has the same Mendelian units in its leaves as are possessed by *B. bursa-pastoris* is held to further confirm its direct derivation from that species.

By hybridization many elementary forms are produced from a small number of initial mutations, and the whole series of such elementary forms occurring in one species may be paralleled in a nearly related species by the same means.

The smallness of the ratio of occurrence of the *Heegeri* type of capsule indicates that that species owes its capacity for self-maintenance in competition with its parent, to the comparative infrequency of cross-fertilization.

The Effect of Heat on the Starch Grain:
Professor H. KRAEMER, Philadelphia College of Pharmacy. (By title.)

The Relation of Plant Societies to Evaporation: Professor E. N. TRANSEAU, Eastern Illinois State Normal School.

Methods for the Control and Measurement of Soil Moisture: Dr. BURTON E. LIVINGSTON, Carnegie Institution of Washington.

For controlling soil moisture, a porous cup (of the form used in the evaporation studies described in Publication No. 50 of the Carnegie Institution and in the *Plant World* for December, 1907) is connected by rubber stopper and glass, rubber or lead tubing to a reservoir of water, and the cup

is buried in the soil of the pot or other culture container. After equilibrium has been attained, water is taken into the soil only as fast as it is removed. The height of the reservoir, and hence the length of water column to be lifted, determines the amount of moisture which will be maintained in the soil. The reservoir may be of any size, so that the culture may be continued for an indefinite period without attention. The device for measuring soil moisture is essentially the same apparatus as that just described, so arranged that the cup may be filled and emptied at will by means of two tubes which extend above the soil surface. The rate of water flow into the soil, taken for a short period beginning with the filling of the cup, is an index to the attraction of the soil for moisture, and therefore to its moisture condition, the instrument having been previously calibrated for the particular soil question.

Some Unsolved Problems of the Prairies:

H. A. GLEASON, University of Illinois.

Rapid settlement has almost completely destroyed the prairies of the eastern arm of the prairie province, leaving a number of important ecological questions unsolved. Among them are: (1) The original causes which led to the occupation of the territory by forest rather than by prairie; (2) the order of invasion of the prairie flora; (3) the manner and rate of invasion of the forests from the southeast; (4) the relation of prairie fires to the forest; (5) the tension lines between the upper austral prairies and the transition forest on the north and the lower austral forest at the south; (6) the structure and composition of the prairie associations. Some of these can never be solved completely, but careful studies on the scattered fragments of prairies still available may even yet do

much to give a clearer idea of the ecology of the original prairies.

Type Specimens of American Grasses in European Herbaria: Professor A. S. HITCHCOCK, Bureau of Plant Industry.

In order to complete a revision of the North American species of *Panicum* it was necessary to consult the types deposited in European herbaria. The following list of collections consulted may be of interest to those who contemplate doing similar work, for the exact location of some of these is not generally known.

Antwerp: Herbarium of Dr. Van Heurck. Collection of Salzmann from Bahia.

Brussels: Jardin Botanique de l'Etat. Collection of Galeotti from Mexico. Some Fournier types.

Paris: Muséum d'Histoire Naturelle. General herbarium: types of Desvaux, Steudel, Fournier, Richard, Kunth (H.B.K.). Segregated: herbaria of Michaux and of Lamarek; herbarium of Cosson with some Poiret types; and of Drake del Castillo with some Michaux types sent by Richard.

Madrid: Jardin Botánico. Types of Lagasca and Cavanilles.

Florence: Orto Botanico. Types of Poiret (cited in Encyc. Suppl. as "herb. Desfont.").

Padua: Orto Botanico. A collection of Bosc from Carolina.

Geneva: Herbarium. Delessert and the private herbaria of de Candolle and of Barbey (Herb. Boissier).

Munich: Botanisches Museum. Collection of Martius from Brazil, with types of Nees and Döll.

Vienna: K. K. Naturhistorisches Hofmuseum.

Graz: Private herbarium of Professor Hackel, now at Attersee.

Prague: Collection of Haenke with

Presl's types; part at the Botanical Garden of the German University and part at the Bohemian Natural Museum.

Halle: Botanischer Garten. Professor Mez allowed me to consult the collections of *Panicum* loaned him by several institutions.

Leipzig: Botanischer Garten. No grass types from America.

Göttingen: Botanischer Garten. Types of Grisebach (Wright's Cuban plants and types from Argentina) and of Meyer (Prim. Fl. Esseq.).

Berlin: Botanischer Garten at Dahlem. Types of Link, Sprengel, Kunth, C. Mueller and Nees (Sellow plants from Brazil). The Willdenow herbarium is segregated.

St. Petersburg: Herbarium Trinius at the Imperial Academy of Sciences and the general collection at the Botanical Garden with Fournier's types based on plants of Karwinsky and F. Mueller.

Stockholm: Natural History Museum. Herbarium of Swartz's West Indian plants and the types of Fries and Lindmann from Argentina.

London: Three large collections. Royal Gardens at Kew, with types of Grisebach (Fl. Br. W. I.), Bentham and Pursh. British Museum (Dept. Botany), the collections of Walter and of Sloane, segregated and those of Raddi, Rudge, Robert Brown, and Gronovius. The Linnean herbarium at the rooms of the Linnean Society.

The Bisexual Inflorescence of Humulus lupulus: Dr. W. W. STOCKBERGER, Bureau of Plant Industry.

Humulus lupulus L. is regarded as a strictly dioecious plant, but at rare intervals cultivated forms of the common hop have been observed bearing on the same flowering branches both staminate and pistillate flowers. By several observers these pistillate flowers are regarded only as aborted

forms of the staminate flowers. For several years this phenomenon has been frequently observed by the writer on the Pacific coast. The anthers of the staminate flowers in all the cases examined bore mature pollen grains. The pistillate flowers also were normally constituted. It appears, therefore, that the determinants requisite for the production of gametes of each sex are present in the cells of the plant usually spoken of as female. It is possible that we have here a modification in the habit of the plant produced by the conditions of culture. The inherence of the determinants of each sex in a single plant is further shown in the somewhat rare cases in which a plant reproduces by means of runners. In the wild state and under certain conditions of culture the underground runners of the hop plant occasionally send up shoots which when mature bear flowers of the opposite sex.

The Possible Rôle of Light in Relation to Alpine Plants: Professor C. H. SHAW, Medico-Chirurgical College, Philadelphia.

Readings with the actinometer and black bulb thermometer *in vacuo* in the Selkirks seem to prove that, as is commonly believed, light at high altitudes is considerably more intense than on adjacent lowlands and that the difference is chiefly in the refrangible end of the spectrum.

Cultures of plants were made by the writer and Mr. William Moore under experimental conditions. When *additional* blue-violet light was allowed to fall on plants growing in ordinary daylight, the plants exhibited a distinct structural response. Leaves were more hairy, and internodes shorter than in the control series.

The whole question is therefore open, with the probability that the character of light at high altitudes may have a morphogenic value differing from that at low altitudes.

The Causes of Timber Lines on Mountains; Snow as a Mechanical Agency: Professor C. H. SHAW, Medico-Chirurgical College, Philadelphia.

The phenomena of timber line are not adequately explained by the factors which have been assigned. The timber lines of the White Mountains and Adirondacks can well be referred to the drying action of cold winds, but not so those of the Selkirks. In this case snow, acting as a mechanical agency, plays the chief part. It may do so in two ways:

(a) Small trees are directly broken and abraded by weight of snow or by snow creep.

(b) Small trees and lower branches which are long held under the late-lying, wet beds of snow, suffer a sort of drowning and become a prey to fungi.

When the struggle of trees for existence is primarily with wind, their height is limited, they grow thickly in level-topped societies, and the upper outposts of the forest are in local depressions or sheltered spots. Wind-cripples have dead or dying tops, often with entire loss of the conical shape; the growth of their branches is limited to a critical line. This leads to a densely branched and often one-sided habit.

On the other hand, when the struggle of trees for existence is primarily with snow, the forest as altitude increases is resolved into groups of trees. These become more separated, and the upper groups of the trees occupy ridges and local elevations. Snow-cripples possess the spire form, with flourishing upper shoots, but the lower branches and foliage are dying or dead, broken by snow and attacked by fungi.

The alpine fields of the Selkirks, which begin at about 6,000 feet, are thus chiefly due to snow. Higher up the characteristic forms of wind-cripples are seen.

It is suggested that the present ideas may be of application to the Alps as well.

Cultures of Uredineæ in 1907: Professor J. C. ARTHUR, Purdue University.

Eighth annual report on culture work with plant-rusts. Nearly one hundred collections with resting spores and a fifth as many with active spores were employed. The culture of seventeen species was attempted, with only negative results. Thirty species were grown with success, eight of which are now reported for the first time. Of the latter *Puccinia vexans* and *P. Cryptandri* were grown from amphispores, being the first amphispore cultures ever made. Three sedge rusts were connected with æcial forms, an *Allium* rust carried through its cycle and two species of *Gymnosporangium*, *G. Betheli* and *G. inconspicuum* connected with æcial stages.

Notes on Certain Rusts, with Special Reference to Their Peridermial Stages: Dr. G. P. CLINTON, Connecticut Agricultural Experiment Station.

The *Peridermiums* (a form genus which occurs on coniferous hosts) are the æcial stages of heterœcious rusts which belong, in their telial stages, to at least seven different genera as now recognized. So far there have been found in North America forty-nine species belonging to these genera, while only thirty species of the *Peridermiums* are known here. Investigations so far have definitely connected only a few of these species. Shear has shown that *Peridermium cerebrum* belongs to *Cronartium Quercus*; Kellerman, that *Peridermium Rostrupi* belongs to *Coleosporium Campanulæ*; and the writer, that *Peridermium acicolum* belongs to *Coleosporium Solidaginis*. European investigators have solved the relationships of three or four other species whose æcial or other stages have been found here, but these re-

sults have not yet been confirmed with American material; and American writers have suggested the possible relationship of a few more species. During the past year the writer made a special study of the various stages of such of these rusts as occur in Connecticut, with the result that through field observations, confirmed by indoor inoculation tests, the relationships of two more species are now known. *Peridermium pyriforme*, which was found on *Pinus sylvestris* and *Pinus rigida*, was found to be the æcial stage of *Cronartium Comptoniæ* on *Comptonia asplenifolia*; and *Peridermium consimile*, on *Picea nigra*, was connected with *Melampsoropsis Cassandrae*, on *Cassandra calyculata*. Some evidence was also obtained that possibly *Peridermium Peckii*, on *Tsuga canadensis*, is the æcial stage of *Chrysomyxa albida*, on *Rubus hispidus*; but further proof is needed before this can be stated positively, since there are certain points in their structure that also make it unlikely that they have any relationship.

Further Studies of the Anthracnoses: Dr. C. L. SHEAR and Miss ANNA K. WOOD, Bureau of Plant Industry. (By title.)

Sporangia, Conidia and Zygosporangia in the Genus Choanephora: Professor A. F. BLAKESLEE, Connecticut Agricultural College.

Choanephora curcubitarum (B. & Rav.) is one of the mucors found not infrequently infecting withered squash blossoms and causing a soft rot of the fruit. Up to the present time only the *Ædocephalum*-like conidial stage has been found in this country and its connection with the mucors has been somewhat in doubt. By cultivating the fungus at a temperature of about 25° C. under proper conditions of moisture, the writer has obtained the sporangia and the zygosporangia. The species is heterothallic and its (+) and (—) races

have been secured from various localities in this country and in South America.

The Development of the Ascocarp of Melanospora: Professor J. B. OVERTON, University of Wisconsin. (By title.)

Progressive Cleavage in Didymium: Professor R. A. HARPER, University of Wisconsin. (By title.)

On the Development of Immunity for Heart-rot Diseases in Trees: Dr. HERMANN VON SCHRENCK, Missouri Botanical Garden. (By title.)

The Influence of the Swaying of the Wind on the Formation of Mechanical Tissue in Plants: Professor F. C. NEWCOMBE, University of Michigan. (By title.)

A Study of Edaphic Conditions in Peat Bogs near Ann Arbor: Dr. G. P. BURNS, University of Michigan. (By title.)

DUNCAN S. JOHNSON,
Secretary

JOHNS HOPKINS UNIVERSITY

SCIENTIFIC BOOKS

Evolution of Mammalian Molar Teeth to and from the Triangular Type. By HENRY FAIRFIELD OSBORN, Sc.D., LL.D., D.Sc. Edited by W. K. GREGORY, M.A. Pp. 250. New York, The Macmillan Company. 1907.

This book, the most valuable contribution to mammalian odontology since that of Sir Richard Owen, consists of a series of collected and revised researches upon trituberculy with new sections on the forms and homologies of the molar teeth in the different orders of mammals. The theory of trituberculy was a conception of the late Professor Cope, but was elaborated by Professor Osborn, who has been by far the greatest exponent of the idea. Four principles have been developed in connection with the general theory: (1) That in the most primitive Tertiary mammalia there are "three main tubercles on the crowns of both upper and lower molars, disposed in triangles"; primitive trituberculy. (2) Origin of the tritubercular

types from the single reptilian cone. "*The tritubercular type sprang from a single conical type by the addition of lateral denticles.*"

(3) Cusp addition or differentiation; "a process analogous to budding or outgrowth in other tissues." An opposing theory to this is that of concrescence. (4) Reversed upper and lower triangles. "*In the lower molars the reptilian cone is external and the two denticles internal, while in the upper molars the reverse is the case, namely, the reptilian cone is internal and the denticles are external.*" It is on this principle that the Osbornian nomenclature, implying a serial homology between the cusps of the upper and lower molars, is based. As applied to the lower molars this principle is generally accepted; but as applied to the upper teeth, it has been most vigorously opposed in the light of three different classes of positive evidence—embryological, anatomical and paleontological. The embryological evidences seem to point to the antero-external cone (Osborn's paracone) as of the greatest antiquity and therefore the reptilian cone. This is also borne out by the analogy of the premolar cusp development (premolar-analogy), and by that of the lower molars. Evidence in favor of Osborn's theory is derived from paleontology, and is also shown by the mechanical development of the cusps, while on the other hand recent interpretation by Gidley of paleontological evidence is in harmony with that of embryology and with the premolar analogy theory.

In the summary of his introduction Professor Osborn says: "That the four great principles of molar evolution *do not stand or fall together.*" The first principle, that of primitive trituberculy, is now almost undeniable; the *reptilian cone origin* theory next in order of demonstration and acceptance; the *cusp addition* theory finding at present more advocates than the opposing idea of concrescence. Finally the greatest conflict of evidence occurs with reference to the homologies of the upper and lower cusps. There is no middle ground; either the Cope-Osborn theory is correct and the premolar-analogy plus the embryological theory wrong, or the reverse is true.

Following the introductory section is an admirable classification of the Mammalia and a diagram showing the chronological and stratigraphic succession of the formations in which fossil mammals have been found in the western states.

Chapter I. is a reprinted essay on the teeth of the Mesozoic mammals; Chapter II. sets forth the first outline (1888) of tritubercular evolution in mammals; Chapter III., trituberculy in relation to the human molar teeth and the Primates; Chapter IV., trituberculy in its application to the molar teeth of the ungulates or hoofed mammals and the completion of the nomenclature; Chapter V., the second outline (1897) of tritubercular evolution in Mammalia with discussions of criticisms; Chapter VI. is a brief review of the dental types observed in the successive geological periods; their chronological and geological succession; while Chapter VII. will prove of extreme value to the student of paleontology as it discusses and illustrates all of the ordinal types of molar teeth and often the entire dentition. Bibliographical references are found at the close of each section of this chapter and serve to show how far afield one must go to find the wealth of information which it contains. In the eighth chapter the evolution of the premolar teeth is discussed. Those of primitive mammals; and the adaptation of premolars in which "they either (a) enter upon an especial adaptive evolution of their own, as for example in the upper sectorials of the cats (*Felidæ*), or the elaborate fourth premolars of the *Plagiolacidae*, or (b) by a serial analogous development they more or less closely mimic the structure and supplement the exact functions and uses of the molar teeth; this mimicry reaches its highest extreme among the *Perissodactyl* or odd-toed Ungulates, where the premolars gradually *metamorphose into the molar pattern* and even become superior to the molars in size and complication."

Osborn speaks further of this premolar metamorphosis as being "from the biological standpoint most interesting as illustration of convergence, because *form exactly similar to that of the molars* is finally attained from

somewhat dissimilar beginnings." This of course depends upon whether one holds to the Cope-Osborn theory or that of premolar analogy. If the latter be true this premolar adaptation is merely a case of parallelism.

Chapter IX. is a very frank review of the objections and difficulties which have arisen with reference to the Cope-Osborn theory and of the rival theories that have been set forth. Professor Osborn finds that two classes of criticism have arisen: (I.) That the tritubercular type is not primitive. (II.) That the Cope-Osborn theory of the origin of the superior molars is incorrect. (I.) The opposing theories to that of trituberculy each presuppose a more complex tooth as the primitive one, arguing that the tritubercular, triconodont and protodont stages are secondary simplifications. The weight of evidence, however, seems to be largely in favor of trituberculy. (II.) The three powerful arguments arrayed against the Cope-Osborn idea of the origin of the upper molars, that of embryogeny, premolar analogy, and finally a different interpretation of the paleontological record, seem difficult to combat. Osborn believes the question to be still *sub judice*, in spite of the fact that he and Gregory have brought forth all of the evidence which ripe learning and exhaustive study have produced.

Writers agree that the Osborn nomenclature should in any case be retained because of its wide use in paleontological literature and its great convenience. One is somewhat dismayed, however, by the fact that the fourth upper premolar and first molar of the horse, for instance, teeth almost indistinguishable in structure, must needs be described by totally different nomenclatures.

The final chapter discusses the idea of rectigradations in the evolution of tooth cusps.

The whole book gives evidence of the most painstaking work, not only on the part of the author but of his able editor as well. Perhaps its most delightful feature is the judicial fairness and frankness with which the whole evidence is reviewed and discussed.

RICHARD S. LULL

YALE UNIVERSITY

Immunochemistry. The Application of the Principles of Physical Chemistry to the Study of the Biological Antibodies. By SVANTE ARRHENIUS. New York, The Macmillan Company. Pp. 309. \$1.60.

During the last year Arrhenius has published three books which, in the opinion of the reviewer, embody the most advanced results and conceptions of modern science in a classical form. Those who are interested in the methodology of science and the theory of cognition will learn by what methods those scientists, of whom Arrhenius is a representative, are able to build on certainty instead of upon the vague basis of hypothesis; and those who doubt whether or not we have reached any definite conception of the nature of matter will find authoritative information in the books of Arrhenius. These books are: (1) "The Theories of Chemistry," (2) "Das Werden der Welten," (3) "Immunochemistry." The English edition of the latter has just appeared and it is to this that we wish to call special attention.

After Metchnikoff had made the attempt to explain the phenomena of immunity by phagocytosis Ehrlich showed that immunity is due to a chemical reaction between toxin and antitoxin. With the clear foresight which has characterized the scientific career of this brilliant investigator he saw that the ultimate proof for the correctness of the purely chemical conception of the phenomena of immunity could only be furnished by the physical chemist. Through the influence of Madsen, Arrhenius was induced to undertake this task. Partly alone, partly in collaboration with Madsen and his school, he solved the problem in the only way on which it could be solved—namely, by showing that the action of the antitoxin upon the toxin followed the law of Guldberg and Waage. In the execution of this task he adopted the principles of eliminating the unnecessary and disturbing variables and presenting the results as the function of the minimal number of independent variables. The fact that this principle is not sufficiently appreciated by biologists has led here, as in all similar cases, to some opposition. It is, however, obvious that

if a variable has been overlooked its effects can easily be added to the results; while without an attempt at the utmost simplification in the beginning no start and no progress would have been possible.

The writer of this review would especially call the attention of the younger biologists to the importance of a study of Arrhenius's books.

JACQUES LOEB

The Electrical Conductivity of Aqueous Solutions. A Report presented by ARTHUR A. NOYES, W. D. COOLIDGE, A. C. MELCHER, H. C. COOPER, YOGORO KATO, R. B. SOSMAN, G. W. EASTMAN, C. W. KANOLT and W. BÖTTGER. Contribution from the Research Laboratory of Physical Chemistry of the Massachusetts Institute of Technology No. 19. Carnegie Institution of Washington, Publication No. 63. Pp. vi + 352.

This volume is a report on a monumental series of investigations which have been in progress in Professor Noyes's laboratory during the past five years upon the electrical conductivity of aqueous solutions of certain salts, acids and bases through a wide range of temperatures extending from 18° to 306°. The work was undertaken with the expectation of studying the properties of aqueous solutions at temperatures up to the critical temperature and beyond, a task burdened with very serious difficulties, as will be realized when one recalls that the critical temperature of water is in the neighborhood of 360°, and that at this temperature the conductivity cell must not only safely withstand a pressure of something like 200 atmospheres without leaking and without contaminating the dilute solutions employed, but must also do this under such conditions as will permit accurate control of the temperature, volume and conductivity of the solutions.

Up to the present time the highest temperature reached is 306°, but to one who studies the ingenious manner in which the experimental difficulties have so far been overcome there can be no doubt that the original plan will be ultimately realized.

Among the important results presented in this volume are data showing the effects of

widely varying temperature conditions on the specific volumes of water and water solutions, on the equivalent conductivities of electrolytes, on the specific migration velocities of the ions, on the degree of ionization of various solutes, on the self-ionization of water and on hydrolysis.

The effect of rising temperature is to enormously increase the equivalent conductivity of aqueous solutions and the speed with which the ions travel in such solutions, the speed of the latter continuing to increase even after the equivalent conductance has reached a maximum value, thence to decline with rising temperature. The significant observations have also been made that the specific velocities of all monovalent ions tend toward equality with rising temperature, while divalent ions approach a value double that of monovalent ions. These tendencies, together with the effect of rising temperature on conductance, are illustrated by the behavior of potassium chloride and hydrochloric acid. The equivalent conductances of potassium chloride and hydrochloric acid, extrapolated for zero concentration, which at 18° are respectively 130.1 and 379.0 reciprocal ohms, have been found to be 1,120 and 1,424 respectively at 306°.

Various investigators have called attention to the fact of a connection between the viscosity of the solvent and ionic velocities. It is shown in these investigations that the conductance of salt solutions increases with rising temperature at practically the same rate as the fluidity of the solvent, at any rate up to 156°, which is the limit to which viscosity measurements have been made.

Increase of temperature has been found to be accompanied by a marked diminution of the ionization of the solute and especially at higher temperatures the rate of decrease becomes very great. For example, in a 0.01 normal solution of hydrochloric acid, the percentage ionization at 18° is 97.1, while at 306° it is but 82 per cent. Of an 0.08 normal solution of potassium sulfate, 73 per cent. of the solute is present as ions at 18°, while at 306° only 23 per cent. is present in the ionic condition. The effect of rise of temperature

on the dissociation of weak acids and bases is even more marked, as is shown by the change of the affinity constant of acetic acid from 0.0000183 at 18° to 0.000000139 at 306°, and of ammonium hydroxide from 0.0000172 at 18° to 0.000000093 at 306°.

In view of the diverse opinions which have been expressed concerning the connection between the dielectric constant of a solvent and its ionizing power, it is interesting to note that these researches show that the ratio of the concentration of the un-ionized portion of the solute at two different temperatures (at least up to 100°, the limit to which the dielectric constant of water is known) agrees very well with the ratio of the dielectric constants for the same temperature interval.

Since the equivalent conductance of an electrolyte is a function of two variables, specific speed of the ions and the degree of ionization, and since the effect of changing temperature on the ionization is most conspicuous at higher temperatures, it follows that the equivalent conductance must pass through a maximum value thence to diminish continuously towards zero as the temperature passes the critical point. This maximum has been realized in the case of a considerable number of solutes, especially in the more concentrated solutions.

Quite contrary to the influence of rising temperature in diminishing the dissociation of electrolytes in solution is the effect on the ionization of water itself. The ionization constant of water rises with tremendous rapidity up to 100°, thence more slowly, reaching a maximum value over 5,000 times the value at zero, after which it decreases with further rise of temperature. This great increase in the ionization of water with rising temperature, together with its weaker ionizing effect on electrolytes in solution, accounts for the enormously greater tendency of salts to hydrolyze at higher temperatures.

As at ordinary temperatures, so also at higher, the mass law does not apply to solutions of salts, strong acids and bases. On the other hand, the applicability of the law to weak acids and bases has been shown to be independent of the temperature. In this con-

nection it is important to note that in the summary to this series of papers Dr. Noyes expresses his conviction that "the ionization of salts, strong acids and strong bases is a phenomenon primarily determined not by specific chemical affinities, but by electrical forces arising from the charges on the ions, that it is not affected, excepting in a secondary degree by chemical mass action, but is regulated by certain general, comparatively simple laws, fairly well established empirically, but of unknown theoretical significance, and that, therefore, it is a phenomenon quite distinct in almost all aspects from the phenomenon of dissociation ordinarily exhibited by chemical substances, including that of the ionization of weak acids and bases."

It is scarcely necessary to emphasize the importance of such a study of aqueous solutions as Professor Noyes has inaugurated, for, in addition to the direct physical and chemical significance of the knowledge thus to be gained, every one will recognize the importance of such investigations in their bearing on certain phases of chemical technology and chemical geology.

E. C. FRANKLIN

STANFORD UNIVERSITY

SCIENTIFIC JOURNALS AND ARTICLES

THE opening (January) number of volume 9 of the *Transactions of the American Mathematical Society* contains the following papers:

F. L. GRIFFIN: "Certain periodic orbits of k finite bodies revolving about a relatively large central mass."

G. H. DARWIN: "Further note on Maclaurin's spheroid."

O. D. KELLOGG: "Potential functions on the boundary of their regions of definition."

O. D. KELLOGG: "Double distributions and the Dirichlet problem."

G. A. MILLER: "Groups defined by the orders of two generators and the order of their commutator."

E. J. WILCZYNSKI: "Projective differential geometry of curved surfaces. (Second memoir.)"

The February number (volume 14, number 5) of the *Bulletin of the American Mathematical Society* contains: Report of the First Regular Meeting of the Southwestern Section,

by O. D. Kellogg; "Note on the Composition of Finite Rotations about Parallel Axes," by Alexander Ziwet; "On an Integral appearing in Photometry," by A. S. Chessin; "Hermitian Forms with Zero Determinant," by J. I. Hutchinson; "Two Tetraedron Theorems," by H. S. White; "Singular Points of a Simple Kind of Differential Equation of the Second Order," by C. A. Noble; "The Theory of Electricity" (review of Abraham's *Theorie der Elektrizität*, volume 2), by E. B. Wilson; "Notes;" "New Publications."

The March number of the *Bulletin* contains: Report of the Fourteenth Annual Meeting of the Society, by F. N. Cole; Reports of the December Meeting of the Chicago Section and of the Joint Meetings at Chicago of Mathematicians and Engineers, by H. E. Slaught; Report of the Fifty-eighth Meeting of the American Association for the Advancement of Science, by G. A. Miller; "Shorter Notices" (Larmor's Memoir of G. H. Darwin, by E. W. Brown; Lambert's Computation and Mensuration, by E. W. Ponzer; Schütte's *Darstellende Geometrie für Gymnasien*, by Virgil Snyder; Thompson's *Petrus Peregrinus*, by F. Cajori; Broggi's *Traité des Assurances de la Vie*, by G. H. Ling); "Notes;" "New Publications."

SOCIETIES AND ACADEMIES

THE SOCIETY OF CHEMICAL INDUSTRY

IN place of the regular meeting of the Society of Chemical Industry on January 24, a joint meeting of the Society of Chemical Industry, the American Chemical Society, the American Electro-Chemical Society, the Chemists' Club of New York City and the Verein Deutscher Chemiker was held for the presentation of the Perkin Medal to Mr. J. B. F. Herreshoff. Mr. George C. Stone was in the chair.

After a few introductory remarks by the chairman, in which he emphasized the importance of stimulating chemical research by proper recognition, and bringing to the attention of the audience the life-work of Sir Perkin, who not only discovered a new product, but worked out its manufacture, developed

the method of using the same and sold it, he requested the secretary to read the report of the Perkin Medal Committee, and to speak about the meaning and importance of the Perkin Medal.

The secretary then delivered his address, "History of the Perkin Medal and Report of the Committee for its Presentation."

The chairman then called upon Professor M. T. Bogert to speak on the subject allotted to him, "Stimulus given Chemical Research and Invention by Suitable Recognition."

Then Mr. H. A. Metz followed with his address on "Services rendered by the Chemist in the Development of the Coal Tar Industry," and then Professor S. A. Tucker spoke on "Electricity as applied to Industrial Chemistry."

Professor Charles F. Chandler then presented the Perkin Medal to Mr. J. B. F. Herreshoff, with an appropriate and extremely interesting address.

Mr. Herreshoff in a well-chosen speech acknowledged the honor conferred upon him.

The ceremonies were concluded by an address by Dr. William H. Nichols, in which he described the intimate association between the recipient of the Perkin Medal and himself for the last thirty years. He also read a cable which he had just received from England, in which Lady Perkin and her daughters congratulate Mr. Herreshoff on receiving the medal.

Mr. J. B. F. Herreshoff was born in Bristol, R. I., and is a brother of the well-known yacht designer and builder; received his college education at Brown University and in 1870 was assistant instructor in chemistry for two years. After that he was chemist with Professor Charles A. Seely in New York and after that chemist for the Silver Spring Dyeing Establishment and chemist with William Habershaw at New York. In 1875 he was made Superintendent of the Laurel Hill Chemical Works of W. H. Nichols & Co. In 1890 he was made vice-president of the corporation of the Nichols Chemical Co. In 1900 he became the vice-president of the Nichols Copper Co. and consulting engineer of

the General Chemical Co., and is still occupying these positions.

H. SCHWEITZER,
Secretary

THE CHEMICAL SOCIETY OF WASHINGTON

THE 180th regular meeting of the Washington Section of the American Chemical Society was held at the Cosmos Club on Friday, February 13, 1908, at 8 P.M. The attendance was 44. The following papers were presented:

E. T. Allen: "The Rôle of Water in Tremolite and certain other Minerals."

H. C. McNeil: "Some Metallic Salts of Guaiacol."

F. W. Smither: "A Sample of Ferro-phosphorus."

J. A. LECLERC,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION

THE fifth regular meeting of the session of 1907-8 was held at the Chemists' Club, 108 West 55th Street, on February 7.

Professor Chas. Baskerville read the first of a series of three papers relating to the chemical department of the College of the City of New York, his title for the evening being "Laboratory Organization."

Dr. A. S. Cushman, of the Office of Public Roads, read a paper on "The Extraction of Potash from Feldspathic Rocks."

The electrolytic method described was of scientific value only, but Dr. Cushman hoped it might lead to some commercially possible process. He described a practical method of rendering the rock itself available for fertilizing purposes and finally called attention to the great advantage this country would derive from having a cheap domestic source of potash.

C. M. JOYCE,
Secretary

THIRTEENTH ANNUAL WINTER MEETING OF THE VERMONT BOTANICAL CLUB

THIS meeting was held January 17, 18, 1908, at the University of Vermont, Burlington. The following papers were read:

"Progress in the Forestry Movement," by Dr. L. R. Jones, University of Vermont.

"Notes on Moss," by Miss Towle, Edmunds High School.

"Seven Giant Puffballs," by Mrs. Lord, Burlington.

"Questions concerning Weed Distribution," by L. C. Cook, University of Vermont.

"The Fruits of some Shrubs and Trees of Vermont," by F. V. Rand, University of Vermont.

"Local Observations on Effect of Altitude on Vegetation," by Joseph A. Chapin, Middlesex.

"The Botrychiums of Dorset," by Allan Bourn, Yonkers, N. Y.

"*Oxalis Brittonæ* at Pownal," by Dr. Tracy Hazen, New York.

"Discovery of the Water Chickweed in Vermont," by Richard W. Woodward, Yantic, Conn.

"The Late Alphonso Wood," by Miss Alice E. Bacon, Bradford.

"The Fernery," by Miss Elizabeth Billings, Woodstock.

"Reproduction in Bread Mold," by L. R. Whitcomb, Edmunds High School.

"A New Station for the Green Dragon," by Geo. L. Kirk, Rutland.

"Soil Acidity in Relation to Flora," by H. A. Edson, University of Vermont.

"Some Rare Plants on Mount Horrid," by D. L. Dutton, Brandon.

"A Bacterial Rot of the Muskmelon," by N. J. Giddings, University of Vermont.

"A Trip to Mount Mitchell," by W. W. Eggleston, Rutland.

"Mount Washington" (illustrated with lantern), by John W. Ritchie, Jr., Boston.

Professor M. L. Fernald, Gray Herbarium, Harvard University, was the guest of the club and delivered a public lecture on "The Flora of the Shickshock Mountains and the Gaspé Coast" (illustrated with lantern).

The following were elected officers for the ensuing year:

President—Ezra Brainerd, Middlebury College.

Vice-president—Cyrus G. Pringle, University of Vermont.

Secretary—L. R. Jones, University of Vermont.

Treasurer—Mrs. N. F. Flynn, Burlington.

The next meeting will be in conjunction with the Federation of New England Natural History Societies at Mt. Washington about July first.

The club has an active membership of nearly 200 and publishes an annual bulletin,

of which the third number will appear in April.

L. R. JONES,
Secretary

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 196th meeting of the Society, held at the Cosmos Club, on Wednesday evening, November 27, 1907, under informal communications, Mr. Willis T. Lee announced the discovery of fossils in the red beds of the foothills region of New Mexico. Collections were made near Rowe, a station of the Atchison, Topeka and Santa Fe Railway in the Pecos Valley and also at a point about five miles northwest of Las Vegas, near the base of the red sediments which are here 5,000 feet or more in thickness. The fossils have been identified by G. H. Girty, of the United States Geological Survey, and found to belong to the fauna characteristic of the lower group of the Pennsylvanian (Carboniferous) series of central New Mexico, now known as the Magdalena group. These collections indicate that a part, at least, of the so-called "Permo-Triassic Red Beds" of the eastern Rocky Mountains are of Pennsylvanian age.

Professor G. D. Harris, of Cornell University, presented informally a summary of the results of his investigations of the salt domes of Louisiana and Texas. The Mississippi embayment is a huge "pitching trough," pitching southward, and in the course of its development, differential uplift or settling of one of the planes has given rise to lines of weakness in two directions, northeast-southwest and northwest-southeast. The points of intersection of such lines generally occur at sharp anticlines and there saturated salt solutions could easily escape upwards into the overlying later formations. But salt waters, if saturated at high temperatures, precipitate, on cooling, a portion of their dissolved salt, and the force which can be exerted by crystallizing salt is of about the same order of magnitude as its ultimate strength. On testing it was found that a 4-inch cube of salt withstands a pressure of 50,000 pounds without even cracking, and the inference is therefore warranted that the crystallizing salt can lift at least 3,000 feet of Tertiary and Quater-

nary sands and clays. Clays and sands, however, have a density of about 2.5, while that of salt is 2.16, and the expansive force of the salt from the crystallizing source will be very circumscribed and the salt domes local in character. The domes in both Texas and Alabama are of similar origin, though some may consist in large part of gypsum, limestone or sulphur as well as of salt. Some of these cores of salts have been pushed up through Cretaceous strata, others through Eocene and many into the Quaternary; they are distinctly exogenous in character and may be termed foreign intrusions. Similar occurrences of salt domes have been noted at Ischel in Algeria and seemingly in the Salt Range of India. The material for these salt domes is considered to have been taken up by the circulating solutions from the late Paleozoic or Mesozoic salt and gypsum layers which constitute the floor of the pitching trough of the Mississippi embayment. The arching or doming up of pervious and impervious strata by the crystallizing salt domes facilitates the segregation of the oil and gas which are also found in this region.

Regular Program

The Occurrence of the Silurian in Western America: Mr. E. M. KINDLE.

Mr. Kindle reviewed briefly the evidence on which many geologists have questioned the reported occurrences of Silurian strata in the western states. Three localities which had come under the speaker's observation were cited from which distinctly characteristic Silurian faunas had been obtained. These localities are in the Wasatch Mountains of Utah, in southeastern Alaska and in northeastern Alaska. The bearing of these observations on one of the problems of Silurian paleogeography was pointed out.

The Origin of Limestone Breccias: Mr. MARIUS R. CAMPBELL.

There is such a common tendency to ascribe all brecciation of rocks to movement, that the writer takes this opportunity to describe the formation of a solution breccia which, fortunately, he was able to observe in various

stages of its development near Fort Stanton, New Mexico. The exposure is in a narrow box canyon cut in horizontally bedded carboniferous limestone.

The initial stage of the process consisted of a solution channel formed by a stream of running water. From this channel the limestone has been dissolved along the bedding planes for varying distances, amounting, in some cases, to as much as fifty feet. As the limestone is variable in composition, the cavities are irregular, extending in many places vertically through the beds, probably along incipient joint cracks. In some places this action had gone on until the more siliceous portions of the rock remained as a mere honeycomb, filling a cavity possibly 100 feet long and 8 or 10 feet high. Subsequently the rock had been eaten through and droppings had filled the cavern with an irregular mass of subangular fragments. The final stage showed this mass recemented by the calcareous waters into a solid breccia completely filling the cavern in which it was formed.

Several examples were seen where this process had gone on to its culmination, and in such cases one could follow the bedding of the limestone above and below and on both sides of the original cavern, but within all trace of bedding had been obliterated. If this process were repeated many, many times, it is conceivable that it might result in the complete brecciation of certain beds which were more soluble than the rocks above and below and thus give rise to such a formation as the "sheet ground" of the Joplin zinc and lead district.

A Recent Vein at Ojo Caliente, New Mexico: W. LINDGREN.

Ojo Caliente is a small village situated in northern New Mexico, about fifteen miles west of Barranca station on the Denver and Rio Grande road. Strong mineral springs of great local reputation issue here from the bottom lands of a small tributary to the Chama River. The water has been analyzed by Dr. Hillebrand. It is of a strongly alkaline character and contains much sodium carbonate. Other interesting constituents are boron,

fluorine and barium. Fluorine is present in considerable amount. Near these springs the foot-hills of pre-Cambrian gneiss contain veinlets of colorless fluorite, which doubtless was deposited by these hot waters when they issued at a somewhat higher elevation. Still higher up on the western slope is found a narrow vein, which contains small amounts of gold and silver in a gangue of colorless fluorite with a little barite, and this vein appears to be capped by a deposit of tuffaceous character, which principally consists of carbonate of lime, but also contains a notable amount of fluorine and traces of gold and silver. It is believed that this vein and the deposit were formed at about the same time, the deposition of the lime carbonate taking place at the surface while fluorite was the principal deposit in the vein a short distance below the surface. All this indicates that these springs have been active during a long time, and it is probable that the hot waters issued at gradually lessened elevations as the erosion deepened the valley.

At the 197th meeting of the society, held on December 19, 1907, Mr. Waldemar Lindgren, the retiring president, presented an address, entitled "Present Tendencies in the Study of Ore Deposits."

Mr. Lindgren stated that he wished to place before the society in the briefest way the tendencies of the study of ore deposits as shown during the first seven years of the twentieth century. In a way the year 1900 might be considered as marking a mile-stone in the progress, for during that year the prevailing theories found specially clear exposition at the hands of many observers. The activity of the various nations in this study was mentioned, and it was shown that the United States, Germany and Scandinavia were most prominent in this respect. The different modes of publication, monographic descriptions *versus* geographic treatment were emphasized. Next, the progress in the technical methods was noted and special reference made to the metallographic methods to the study of opaque minerals. The relation of chemistry to the science of ore deposits occupied attention and it was shown that in

spite of some recent activity much remained to be done in this direction, not only with reference to investigation of methods of mineral formation, but also, for instance, in regard to the examination of the hot springs and their deposits, especially in the western states. The relative merits of the monographic and the geographic treatment of ore deposits was discussed. It was stated that excellent results had been obtained by Professor DeLaunay in Paris by applying this method to the ore deposits of Africa and Italy; it was also shown that much remained to be done in this direction in the United States.

In regard to classification it was shown that no consistent genetic system had as yet been successfully applied. The usefulness of the terms "syngenetic" and "epigenetic" was insisted upon and mention was made of the present tendencies in transferring a large number of deposits to the epigenetic class. This was exemplified by reference to iron ores of Sweden and pyritic deposits in various countries. In the latter class a syngenetic origin was maintained by a few observers, but the general trend of opinion was away from the view of chemical precipitation in lakes or seas and in favor of the subsequent introduction of the metals by hot solutions.

Historic geology has its counterpart in our branch of the science, and it was pointed out that during the last years, both abroad and in the United States, attempts have been made to distinguish the various periods of mineralizing activity.

The latter part of the address was devoted to the question of the origin and genesis of ore deposits, always a most difficult and unsatisfactory problem since its solution must always be based on hypothesis and suppositions. The general prevalence in the end of the last century of the theory of ore deposition by circulating surface waters was noted, and it was shown that the theory of ore deposition from magmatic waters began to find general acceptance in the first years of this century. It is impossible to peruse the literature of any country of the last few years without noticing the remarkable spread of this idea. It seems to pervade the whole atmos-

phere of research and find expression among the workers from all countries. The views of contemporary workers on this subject were explained and it was stated that while the adherents of the theory of magmatic emanations may go too far in some directions, this theory has come to stay, and that it and no other satisfactorily explains a great number of ore deposits.

The prevailing theoretical tendencies of the present might be summed up as follows: We unanimously agree in seeking the ultimate source of the metals in the igneous rocks. We say that the rarer metals in concentrated forms, dissolved in water, emanate from the magmas during and after their eruption into higher levels of the lithosphere, and that minerals containing these metals are deposited along the pathways of the waters. We assert that atmospheric waters may search the congealed rocks, abstract from them a part of the small residues of the valuable metals, and deposit them along the channels. We say further that metamorphism, when acting upon these igneous rocks, is a potent factor in favor of further concentration, aided by the moisture contained in the rocks.

We say finally that as erosion degrades the volcanic mountains and their ore deposits, and the fragments are carried down to form sedimentary beds, the heavy native metals, such as gold and platinum, are concentrated into placers, and the baser metals are distributed as salts of various kinds throughout the beds. Atmospheric waters take up these particles into solution, and, aided by the influence of reducing substances as organic matter, concentrate them as deposits in congenial places.

At the close of Mr. Lindgren's address the fifteenth annual meeting of the society was held for the purpose of electing officers, and the following officers were elected for the ensuing year.

President—Mr. Waldemar Lindgren.

Vice-presidents—Mr. M. R. Campbell and Mr. A. H. Brooks.

Secretaries—Messrs. Ralph Arnold and Philip S. Smith.

Treasurer—Mr. Joseph A. Taff.

Members at Large of the Council—C. A. Fisher,

F. L. Hess, C. E. Siebenthal, G. B. Richardson,
George H. Ashley.

FRED E. WRIGHT,
Secretary

DISCUSSION AND CORRESPONDENCE

THE TEACHING OF MECHANICS

TO THE EDITOR OF SCIENCE: It seems to me high time for something to be done for the teaching of the first principles and definitions of mechanics in our schools. In the "Report of the Committee of the Central Association on Algebra in the Secondary Schools" which has just reached me. I find the following:

6. Momentum = velocity \times weight. It is a measure of the force with which one body strikes another.

The "clear and concise statements" of physical laws which the committee recommends should have the additional merit of a reasonable degree of accuracy.

ERNEST W. BROWN

NEW HAVEN, CONN.

ADJUSTABLE BURDEN BASKETS

TO THE EDITOR OF SCIENCE: Dr. William L. Abbott has sent to the U. S. National Museum five Dyak burden baskets of an entirely new type. They might be called "adjustable burden baskets," since by means of lacings their holding capacity may be expanded or contracted, like a shoe front.

Three of the specimens have each a framework of two U-shaped bows crossing on the bottom; the others have each a four-sided footing, incurved on the sides and pinched in at the corners to fit the lower ends of the four uprights that strengthen the body. All of the specimens are left open, the wrapping on the upper margin being continued down the front opening and united at the "up-set," or place where the bottom turns into the body. Hence the two margins are joined together in the examples with U-shaped bows even to the center of the bottom. The border consists of a small rattan stem, whose close neat wrapping with a thin split of the same material is, at intervals of an inch or two, united with the warps on the sides and to the twined weaving of the upper margins, by mousings.

There are other features of the specimens that will be described and illustrated in a larger paper on Malaysian basket work in preparation. I wish now to call attention to a new variety of textile and to inquire concerning the existence of other examples.

O. T. MASON

U. S. NATIONAL MUSEUM,
January 30, 1908

NOTE ON THE "LAFAYETTE BEDS" OF LOUISIANA

SOME very interesting facts are being brought to light in southern Louisiana by the large number of oil-wells put down since the date of the famous Lucas gusher in 1901.

In undisturbed beds near the coast we find the Quaternary molluscan fauna extending down to about 2,000 feet. The drill samples show sands, clays and gravels, the latter of typical Lafayette type to at least 1,500 feet. Oyster reefs are encountered more or less frequently, showing a sinking of several hundred feet in comparatively late times. In the Texas Galveston well, and in the regions where underlying beds have been brought up near the surface, as in the Jennings oil field, the first pre-Quaternary fauna is *Miocene* in appearance, not *Pliocene*. It has been customary to regard the Lafayette as approximately *Pliocene*. But our well records seem to indicate that the seaward continuation of the gravels in the central portion of Louisiana as well as in those states to the east and west are rather Quaternary than *Pliocene*, and that the whole embayment region, perhaps, was above sea-level in *Pliocene* times and was being eroded instead of being below sea level and receiving hundreds of feet of coarse littoral sediment. It would seem then, that Hilgard's views as to the contemporaneousness and interrelationship of the coarse "Orange sands" in the south and the ice sheets in the north may prove correct in spite of the fact that certain "Lafayette" gravels are said to lie beneath glacial till farther north.

G. D. HARRIS

SPECIAL ARTICLES

THE PENETRATING RADIATION

In the present article three distinct methods will be given to show that the penetrating

radiation which produces part of the ionization in closed vessels is not due to γ rays from radium in the ground itself. It seems quite probable that the penetrating radiation must be due to radioactive products in the air and it is quite probable that the origin of these products is in the ground as Elster and Geitel's theory indicates.

The first method is based upon the radium content of the various rocks as analyzed by Strutt and Eve. The highest value for the radium content of sedimentary rocks was found to be $2.92(10)^{-12}$ grams of radium per gram of rock. The mean value found by Strutt for sedimentary rocks was $1.1(10)^{-12}$ grams and by Eve $.8(10)^{-12}$ grams. The value of the radium content varies greatly with the locality, but for surface soils which are subjected to all the various kinds of weather changes the radium content is probably smaller than that found above. For instance, Strutt found a radium content for chalk at the bottom of a cliff to be $.39(10)^{-12}$ grams and at the top of the same cliff $.12(10)^{-12}$ grams.

$.9(10)^{-12}$ grams per gram of rock will probably be in general a maximum value for surface rocks. This quantity will be called Q .

Eve (*Phil. Mag.*, Sept., 1906) has determined K , the number of ions produced per c.c. by the γ rays in air from one gram of radium bromide supposed concentrated at a point and at a distance of 1 cm. The number of ions produced per c.c. at a point near the surface by a semi-spherical shell of ground of radius r and thickness dr is

$$\frac{2\pi r dr \delta K Q}{r \times .6} e^{-\lambda r},$$

where δ is the density (about 2.7) and λ is the coefficient of absorption for the ground (say .09). The factor .6 comes in since K is given for radium bromide and Q for pure radium; K is $3.1(10)^9$. The total number of ions produced per c.c. per second by the ground would be

$$\int_0^\infty \frac{2\pi r \delta K Q dr}{.6r} e^{-\lambda r}.$$

This value comes out about .8 ion per c.c. per second as a probable maximum amount.

Cooke found that the penetrating radiation produced about 4.5 ions per c.c. per second and McClennan has recently found 9. We thus see that the radium content of the ground is too small to account for all of the ionization produced by the external penetrating radiation. Eve (*Phil. Mag.*, August, 1907) reaches a similar conclusion.

Taking λ for air to be .00004 and assuming Cooke's value for the ionization produced by the penetrating radiation, one can calculate the radium content of the air necessary to furnish a sufficient amount of γ radiation. Supposing these radioactive products to be contained by the lower strata of air—say for a height of 300 m.—one finds that this is equivalent to the radium content of some 60 centimeters depth of ground, taking Q equal to $.9(10)^{-12}$. This depth is rather large, but is not entirely impossible. The diurnal temperature wave penetrates to a depth of about one meter and barometric waves probably penetrate much deeper.

It has been found by Campbell, Wood, the writer and McKeon that the value of the external penetrating radiation which produces part of the ionization in closed vessels varies very considerably in amount, these variations often amounting to more than one or two hundred per cent. in the course of two or three days. If this penetrating radiation is due to the γ rays from the ground it should be practically constant. Moreover, Dike has found that the active deposit in the air also varies very greatly in amount. The writer has found in several instances that the penetrating radiation falls almost to zero value during a heavy rain or snow (*SCIENCE*, July 12, 1907). Now Wilson, Rutherford and Allen have shown that rain and snow carry down radioactive products. If this is true, then, according to our theory, the penetrating radiation would be considerably decreased. During a very heavy rain the decrease should be very noticeable, and might reach a very low value. If the external penetrating radiation is due to radium products in the air, then after a heavy rain the penetrating radiation should increase rapidly for one or two hours after the stopping of the rain, since the products

radium *A*, *B* and *C* will reach equilibrium values in that length of time, and the γ rays come from radium *C* only. Results indicating a recovery of the penetrating radiation similar to this have been noted in one instance.

The writer has tried glass electroscopes with practically all metal parts covered with sulphur. Since glass and sulphur give off very little intrinsic radiation, the ionization should be produced chiefly by the external penetrating radiation. The results found so far are so irregular that they are as yet hard to interpret.

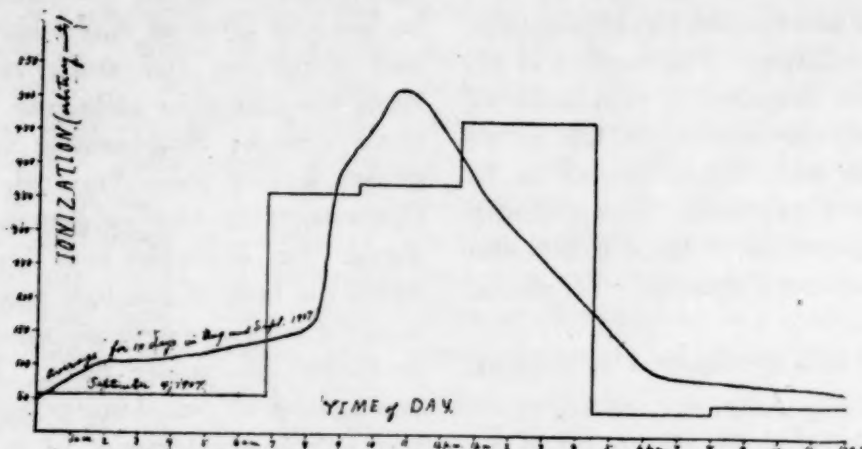
During the summer of 1907 some observations were made in the Cumberland valley (Trenton limestone similar to that analyzed by Eve) seven miles from Harrisburg, and one mile from any town. The electroscopes were lined on the inside with aluminium. Readings during the day were made every few hours. During the night, as the leak was very slow, few readings were made, so that readings were not frequent enough to show the double daily period. The curves do show the enormous increase of the ionization during the early hours of the day. During the night the ionization was very small. The electroscope was placed in a cistern in the ground and was thus surrounded on all sides by at least four feet of water. In this case the penetrating radiation was entirely cut off and it was found that there was no difference in the ionization found during the various parts of the day. Moreover, the amount was roughly the same as that observed during the night on the surface of the ground.

The conclusion is that during the early hours of the day the penetrating radiation was quite large, the walls of the electroscope being thick enough to absorb any β -like rays.

Curve 1 represents the values found September 4, 1907.

Curve 2 represents averages found for several days during August and September, 1907.

During the early hours of the day, according to Elster and Geitel's theory, the ground would become warmer and its emanating power would be greatly increased. Radioactive products would thus accumulate in the lower strata of the air, and as the coefficient



of absorption for air is very small, the penetrating radiation would be very considerably increased. The amount of ionization in the open air is in agreement with this view.

Curve 2 is very similar to the curves representing the hourly rate of change of temperature during the day.

The third method is the determination of the rate of leak below the ground. If the penetrating radiation is due to the γ radiation from radium in the ground, the ionization caused by it should be twice as much in a well or cave in the ground. During the summer the writer tested this by placing the electroscope in a cave. The rate of leak was found to be somewhat less than that occurring during the night on the surface, and was found to be about the same as the leak when the electroscope was surrounded with four feet of water in a cistern. Moreover, the rate of leak was the same during the day as during the night. Similar results have been found by Elster and Geitel.

The conclusion is that a large part of the ionization in closed vessels due to the external penetrating radiation is subject to large variations, and probably consists of γ rays from radioactive products in the air rather than in the ground. These products vary very much in quantity according to atmospheric conditions. A very convenient method of measuring these products is by measuring the amount of the ionization due to the penetrating radiation.

The writer wishes to express his sincere ap-

preciation of the constant spirit of interest shown by Professor Ames.

W. W. STRONG

JOHNS HOPKINS UNIVERSITY

MELTING-POINT CURVES OF BINARY MIXTURES OF THE THREE NITRANILINES

SOME interesting results have developed in the course of an investigation of the subject mentioned above. We prepared a series of mixtures of ortho- and metanitriline, the difference in composition between each consecutive member being 2 per cent., and plotted the melting points of these mixtures against their composition. The curve produced was regular, it fell from 71° , the m. p. of the pure ortho compound, to 54° , the eutectic point, then rose steadily to 114° , the m. p. of pure metanitriline. It is possible, therefore, to employ the curves to determine the composition of mixtures of the two isomers. For this purpose the melting point of the substance under examination is determined; this gives, in general, a temperature corresponding to a position on each limb of the curve and therefore to two possible mixtures. Another portion of the substance is now ground up with an approximately equal weight of either of the pure isomers—say the meta- and the m. p. of this mixture is determined. If it is lower than that of the first one the composition of the original material is represented by the point on the *ortho*-limb of the curve, whereas, if the second m. p. is higher than that of the first, the composition is read off from the

meta- side of the curve. In practise the two melting points are determined simultaneously, on the same thermometer. The method is extremely simple and requires a minimum of time and material, the results, so far as we have been able to test them, appear to be accurate to within 2 per cent. The ordinary method for the separation of these substances consists in laborious, repeated fractional crystallization.

We believe that this application of melting points is new.

A curve of a similar nature is given by mixtures of *meta*- and *paranitraniline*; it also can be used in the manner described above for quantitative analytical purposes. On the other hand, the melting points of mixtures of *ortho*- and *paranitraniline* vary in a remarkable manner, rising and falling through many degrees for relatively small differences in composition. The reason for this behavior is at present under investigation; it is possible that it may be connected causally with the constant, simultaneous production of *ortho*- and *para*-disubstituted benzene derivatives.

We expect to publish the full details of the work outlined in this note in an early number of the *Journal of the American Chemical Society*.

J. BISHOP TINGLE,
H. F. ROLKER

McMASTER UNIVERSITY
TORONTO, CANADA,
December 21, 1907

NOTES ON ENTOMOLOGY

DR. HANS ROESCHKE's revision of *Cychrus*¹ is a work of much interest to American coleopterists since about half of the forms occur in the United States. The material at his command was quite extensive for the western species, but with the eastern species he has a rather slight acquaintance. Dr. Van Dyke has examined for him the types of Leconte and

¹ "Monographie der Carabiden-tribus Cychrini, mit Bemerkungen über Typen und Lokalrassen der amerikanischen Arten von Dr. Edwin C. Van Dyke," *Ann. Mus. Nat. Hung.*, V., pp. 99-277, 1 plate, 1907.

Horn, and from the St. Petersburg Museum he has had types of Eschscholtz, Mannerheim and Ménétries, and much valuable material from the Oberthür collection. He recognizes three genera; *Scaphinotus*, with seven subgenera, among them *Nomaretus* and *Brennus*; *Cychrus*, with two subgenera; and *Sphaeroderus*. Dr. Roeschke is a "lumper," and reduces the host of nominal species to 62; most of them with one or more subspecies, varieties or aberrations under them. There are three new species of *Scaphinotus*, all from Arizona, and one new subspecies of *S. elevatus*. *Nomaretus* is restricted to *N. cavicollis*, *bilobus* and *fissicollis*, the others forming a new subgenus, *Pseudonomaretus*. A new subgenus, *Neocychrus*, is erected for *C. angulatus*, and a new form, *N. behrensi*, from California. There are several new subspecies in *Brennus*. The plate illustrates the structural characters of the genera.

MAJOR T. L. CASEY, who apparently loves to study difficult groups of beetles, has published a large work on one of the little-known subfamilies of darkling beetles.² He divides the subfamily into 25 tribes, nine of which have no representatives in our fauna. There are 350 species, arranged in about 50 genera and several subgenera. Nearly all of the species are described as new, and most of them come from Arizona and California, others from Texas and Utah. Extremely few of the species are as yet known from more than one locality. About 25 of the species are from Mexico or Central America.

MR. W. L. DISTANT has issued another part of his large work on Transvaal insects.³ This part deals with the Fulgoridæ, and contains descriptions of many handsome species. But the most notable thing about the work is the placing of the portraits of Francis Walker and Carl Stål side by side.

² "A revision of the American components of the Tenebrionid Subfamily Tentyriinæ," *Proc. Wash. Acad. Sci.*, IX., 275-522, 1907.

³ "Insecta Transvaaliensia," Part VIII., pp. 181-204, 1907; 2 colored plates and several text-figures.

A REMARKABLE new scale-insect is described⁴ by Mr. Hugh Scott, from a desert plant found in Algeria. The scale is covered by a thick mass of white threads. It belongs to the Dactylopiinae and is near the genus *Asterolecanium*, but the mass of white threads hides the true nature of the insect.

DR. R. STERNFELD has written an account of the mouth parts and the use of the stomach in Ephemeriidae or may-flies.⁵ The mouth parts of the adult may-fly are useless, and rudimentary. He finds that this degeneration began in the nymphal stage. As the adult insect takes no food, another than the natural use has been found for the stomach. It can be inflated with air, and serves to lift the insect during flight or in aerial dancing. The author has made use of American may-flies in much of the work.

MR. E. D. BALL has published a revision of the leaf-hoppers of the genus *Eutettix*.⁶ He divides the genus into three subgenera. He gives tables to the 33 species, one of which has a number of varieties, formerly considered species. There are chapters on the phylogeny of the genus and subgenera, geographical distribution and adaptation, and life histories, and economic relations of the genus. Four excellent plates illustrate the article.

IN the *Proceedings of the Entom. Society of London*, 1907, pp. xliii-xlvii, Mr. E. E. Austen treats of a parasitic African fly whose larva sometimes is a subcutaneous parasite on man. It is known to the natives as the "Tumba" fly. This fly, which belongs to the subfamily Calliphorinae, was formerly supposed to be the *Bengalia depressa*, but Mr. Austen shows that, though very similar, it is quite distinct, and should be known as *Cordylobia anthropophaga* Grünberg.

⁴ "On *Cerococcus eremobius*, gen. et sp. n.; an aberrant form of Coccidae," *Trans. Linn. Soc. London Zool.* (2), IX., pp. 455-464, 1 plate, 1907.

⁵ "Die Verkümmierung der Mundteile und der Funktionswechsel des Darms bei den Ephemeren," *Zool. Jahrb. Abt. Anat.*, XXIV., pp. 415-430, 1 plate.

⁶ "The Genus *Eutettix*," *Proc. Davenport Acad. Sci.*, XII., pp. 27-94, 1907; also as *Contrib. Dept. Zool. Entom. Ohio State Univ.*, No. 27.

THE increased interest taken in the blood-sucking flies of the family Stomoxyidae has induced Dr. M. Bezzi to give a synopsis and catalogue of the species.⁷ A synoptic table is given to the genera, and to most of the species. Three new species are described, two from Africa, one from China. There is a list of species wrongly referred to *Stomoxys*. The author adopts the generic name *Siphona* in place of *Hæmatobia*; our species of the latter genus, however, belong in *Lyperosia*.

THE problems furnished by the life of cave insects holds always a peculiar attraction for entomologists. Mr. A. M. Banta has followed this lure and investigated the fauna (largely insect) of Mayfield's cave in Indiana. The results now issued⁸ make a most interesting addition to cave literature. He records the capture of 63 species of insects and 21 species of Arachnida, and to many of them he has furnished notes on habits or development. More than one half of the insects (33 species) are flies, two of which are described (by Adams) as new species. There are chapters on the origin of cave life, food of cave animals, light, temperature, moisture, etc. A long bibliography completes the paper.

MR. C. G. HEWITT has begun the publication of a considerable work on a long-neglected insect, the common house-fly.⁹ Part 1, which is now issued, deals with the anatomy, both external and internal, of the fly. Especial attention is paid to the internal structure of the head, and the tracheal system is described in detail. The muscular and nervous system is similar to that of *Volucella* and *Calliphora*, while the alimentary canal is much like that of the blood-sucking flies, *Stomoxys* and *Glossina*. Plate 1 gives colored figures of the house-fly, the root-maggot fly, the small house-

⁷ "Mosche ematofaghe," *Rendic. R. Inst. Lombardi Sci. Lett.* (3), XL., 1907, 30 pp.

⁸ "The Fauna of Mayfield's Cave," Publication No. 67, Carnegie Institution of Washington, 114 pages, 13 figures, 1907.

⁹ "The Structure, Development and Bionomics of the House-fly, *Musca domestica* Linn.," *Quart. Journ. Micr. Sci.*, Vol. 51, pp. 395-448, 1907, 5 plates.

fly, and the stable fly. There is a long bibliography.

NATHAN BANKS

SCIENCE IN NEW ZEALAND

THE Canterbury Philosophical Institute, New Zealand, has made arrangements for conducting an important expedition to some of the islands in the Southern Ocean. About twenty New Zealand scientists will be taken to the Auckland Islands and the Campbell Islands in one of the government's steamers, and they will remain on the islands for about a week, inquiring into many branches of scientific work. The primary object of the expedition is to enable observations to be made by Dr. C. Coleridge Farr and other investigators in regard to terrestrial magnetism. The time is very opportune for this, because active work in the same field is being undertaken in other parts of the Pacific Ocean. The council of the Canterbury Institute, however, suggested that the sphere of operations should be largely extended. The government of the dominion has fallen in with the suggestion, and a fairly large party will be taken to the islands.

The Auckland Islands lie about 200 miles south of New Zealand, and the Campbell Islands about 300 miles southwest of the dominion. They are visited periodically by the government's steamers, which have provisions on them for shipwrecked mariners. The Campbell Islands are used as a sheep run, but the Auckland Islands are quite uninhabited. Scientists have reported upon both groups on previous occasions, but the coming expedition will make very comprehensive investigations. The principal interest of the expedition centers in the fact that there will be concerted action to obtain further evidence in regard to the old antarctic continent, which, it is supposed, joined New Zealand to South America on the one hand and to Australia, Kerguelen Land, Mauritius, Madagascar, Africa, and the island of Tristan D'Acunha on the other hand. If this ancient continent had an existence, the Auckland and Campbell Islands are probably waifs and strays that it has left behind. This theory has found general acceptance in New Zealand. A mass of evidence

has been collected by zoologists and botanists, and it seems to leave little doubt that the antarctic continent once enjoyed a mild climate, that it carried large and extensive forests and other vegetation of a rich, luxuriant, and almost tropical character, and that it was inhabited by a large population of animals, some of which are still represented in New Zealand, Australia and South America. The latest evidence in this direction is the discovery of fossil leaves by a member of the "Discovery" Antarctic Expedition in South Victoria Land. These fossil leaves corroborate evidence that was obtained previously. It is hoped that more evidence will be added by the New Zealand scientists. They expect to leave in the middle of November of this year, and to return in the following month. They will be divided into two parties, one party going to each group. The Hon. R. McNab, minister for lands, has been asked to take the lead, but if Parliament is in session he will not be able to take part in the expedition. The following scientists will join the party:

Auckland Islands: Magnetic observers, Dr. C. Coleridge Farr and Mr. H. D. Cook (Christchurch); zoologists, Dr. C. Chilton (Christchurch) and Dr. W. B. Benham (Dunedin), general zoology; Mr. G. V. Hudson (Wellington), insects; Mr. J. Drummond (Christchurch), ornithology; Mr. G. R. Marriner (Christchurch), general zoology. Botanists, Dr. L. Cockayne (Christchurch), ecological botany; Mr. A. H. Cockayne (Wellington), plant pathology, and Mr. B. C. Aston (Wellington). Geologists, Messrs. R. Speight (Christchurch) and Clark (Auckland). Photographer, Mr. S. Page (Christchurch).

Campbell Islands: Magnetic observers, Mr. H. P. Skey and Mr. E. Kidson (Christchurch). Zoologists, Professor Kirk (Wellington) and Mr. J. B. Mayne (Christchurch), Dr. Hilgendorf (Christchurch), general zoology, and Mr. E. B. Waite (Christchurch), ichthyology. Botanists, Mr. M. M. Lairy (Christchurch) and Mr. D. Petrie (Auckland). Geologists, Dr. Marshall (Dunedin), Professor Jarman

(Auckland), mineralogist, and Mr. A. Hamilton (Wellington).

JAMES DRUMMOND

SCIENTIFIC NOTES AND NEWS

THE Silliman lectures at Yale University will next year be given by Dr. Albrecht Penck, professor of geography at the University of Berlin.

THE following have been elected by the council of the British Association to be presidents of sections at the meeting of the Association to be held in Dublin in September next under the general presidency of Mr. Francis Darwin, F.R.S.: Section A (Mathematical and Physical Science), Dr. W. N. Shaw, F.R.S., director of the Meteorological Office; Section B (Chemistry), Professor F. S. Kipping, F.R.S., professor of chemistry in University College, Nottingham; Section C (Geology), Professor J. Joly, F.R.S., Professor of geology and mineralogy in the University of Dublin; Section D (Zoology), Dr. S. F. Harmer, superintendent of the University Museum of Zoology, Cambridge; Section E (Geography), Major E. H. Hills, C.M.G.; Section F (Economic Science and Statistics), Lord Brassey; Section G (Engineering), Mr. Dugald Clerk, M.Inst.C.E.; Section H (Anthropology), Professor W. Ridgeway, professor of archeology in Cambridge University; Section I (Physiology), Dr. John Scott Haldane, F.R.S., university reader in physiology at Oxford; Section K (Botany), Dr. F. F. Blackman, F.R.S., professor of botany in the University of Leeds; Section L (Educational Science), Professor L. C. Miall, formerly professor of biology in the University of Leeds. Invitations to deliver evening discourses during the meeting of the association at Dublin have been accepted by Professor H. H. Turner, F.R.S., Savilian professor of astronomy at Oxford, who will take as his subject "Halley's Comet"; and Professor W. M. Davis, of Harvard University, whose lecture will be entitled "The Lessons of the Colorado Cañon."

THE following Americans expect to attend the Fourth International Congress of Mathematicians, to be held in Rome, April 6-11:

Professor E. H. Moore, University of Chicago; Professor T. S. Fiske and D. E. Smith, Columbia University; Professor G. D. Olds, Amherst College; Professor Virgil Snyder, Cornell University; Professor C. A. Noble, University of California; Professor J. G. Hardy, Williams College; Dr. W. D. A. Westfall, University of Missouri; Dr. C. L. E. Moore, Massachusetts Institute of Technology.

PROFESSOR THEODORE W. RICHARDS, of Harvard University, has been elected an honorary and foreign member of the Chemical Society of London.

THE gold medal of the Royal Astronomical Society was awarded to Sir David Gill by the Royal Astronomical Society at its annual meeting on February 14, in recognition of his contributions to the astronomy of the southern hemisphere.

PROFESSOR GEORGE H. DARWIN and Mme. S. Curie have been elected corresponding members of the St. Petersburg Academy of Sciences.

MR. C. M. CONNER, agronomist at the North Carolina College and Station, has been appointed assistant commissioner of agriculture for the Philippine Islands.

DR. AUGUST MARTIN, professor of gynecology at the University of Greifswald, will visit this country next summer to attend the annual session of the American Medical Association.

PROFESSOR C. W. HALL, head of the geology department of the University of Minnesota, has been chosen to represent the university at the Pan-American Scientific congress to be held at Santiago, Chili, next December.

DR. W. N. SHAW, Emmanuel College, Cambridge University, has been appointed to represent the university at the meeting of Imperial and Colonial meteorologists, convened by the Royal Society of Canada, to be held at Ottawa in May, 1908.

DR. J. P. ROWE, professor of geology in the University of Montana, has been elected president of the Montana State Teachers Association.

THE Montana Academy of Science, Arts and Letters held its annual meeting at Mis-

soula, during the month of December. Dr. H. H. Swain, president of the State Normal School at Dillon, was elected president, and Dr. W. D. Harkins, professor of chemistry at the University of Montana, secretary and treasurer.

MR. J. C. PEARSON, magnetic observer of the Carnegie Institution of Washington, formerly on the magnetic survey yacht *Galilee*, has gone abroad to make magnetic observations in the regions of Asiatic Turkey and of Persia, where but few data have hitherto been obtained.

THE Belgian government proposes to send a meteorological expedition to the Arctic next summer. The expedition will be under the command of M. Georges Lecointe, director of the Royal Observatory at Uccle.

DR. GEORGE H. SHULL, of the Station for Experimental Evolution, Cold Spring Harbor, addressed the Scientific Association of Johns Hopkins University, at the meeting of February 17, on "Recent Aspects of Mendelism."

THE board of managers of the Franklin Institute gave a reception on the evening of February 14, when there was an exhibition of historical models and new inventions and a lecture by Dr. Persifer Frazer on "The Franklin Institute, its Services and Deserts."

THE Association of Technical Institutions of Great Britain was entertained at luncheon by the Drapers' Company, on February 21. The annual meeting followed, when Sir Norman Lockyer delivered his presidential address.

A RESOLUTION was passed at a committee meeting of the London section of the Society of Chemical Industry, held on February 7, recording the great loss the society has suffered through the premature death of its chairman, Mr. Richard John Friswell.

DR. RUDOLF BURCKHARDT, director of the Zoological Station, Rovigno, has died at the age of forty-two years.

DR. MAXIMILLIAN MEISSNER, curator in the Berlin Zoological Museum, died on January 27, at the age of forty-seven years.

DR. ALBERT THIERFELDER, professor of pathological anatomy at Rostock, has died at the age of sixty-five years.

THE U. S. Civil Service Commission announces an examination on March 25, 1908, to fill the position of soil chemist, in the Bureau of Soils, Department of Agriculture, at a salary of from \$2,000 to \$2,500 per annum. Applicants will not be assembled for any of the tests.

THE British Treasury has agreed to give an annual grant of £200 to the Royal Scottish Geographical Society in Edinburgh in lieu of rent of premises. The society has had to vacate the rooms in the National Portrait Gallery, which it had leased from the government at a low rent for a considerable number of years, in favor of the recently created board of trustees of the national galleries of Scotland.

THE following recommendations were adopted at the general meeting of the Geological Society of America, held December 31, 1907, at Albuquerque, New Mexico. The action of the society was taken as a result of an overture made to it by the Association of State Geologists of the Mississippi Valley.

The Geological Society of America recommends to the various organizations concerned:

1. That a general committee on geological nomenclature be formed; one fifth of its members to be from the United States Geological Survey, one fifth from the state geological survey organizations, one fifth from the Canadian Geological Survey organizations, one fifth from Mexico and one fifth from geologists at large as selected by the Geological Society of America.

2. That this general committee have authority to appoint special committees on nomenclature from within or without its own membership for the investigation of the particular questions referred to them, the special committees to report back their conclusions to the general committee with full reasons therefor; the different sections to report in turn to their own organizations.

3. That the fact that any subject is under discussion by this general committee be made known to the scientific public at large.

The purpose of the recommendations is to provide a source from which any geologist may on application obtain advice regarding nomenclature.

The society, by vote at the same meeting, adopted the following preamble and resolution, and instructed the secretary to send copies thereof to the executive authorities of the United States, Canada, Mexico, Newfoundland and the West Indies; to the governors of Alaska, the Philippines, the Hawaiian Islands, Porto Rico and the Canal Zone; to the directors of the several weather bureaus and geological surveys; to the secretaries of the Smithsonian and Carnegie Institutions, the Seismological Society of America and the Committee on Seismology of the American Association for the Advancement of Science. The preamble and resolution, which were drawn up and signed by a committee consisting of Professor T. A. Jaggar, Jr., Massachusetts Institute of Technology; Professor James F. Kemp, Columbia University, and Dr. Edmund Otis Hovey, American Museum of Natural History, are as follows:

WHEREAS: The United States, Canada and Mexico possess in the Cordilleran Belt, Alaska, the Philippines, the Hawaiian Islands, Porto Rico and the Canal Zone a wide field for investigation of active volcanoes and earth movements; and

WHEREAS: Geological science needs permanent records, made in the field, of physical phenomena accompanying earthquakes and eruptions both before and after the event; and

WHEREAS: Such record has direct bearing on prediction, and on protection of life and property, therefore be it

Resolved, That the Geological Society of America strongly recommends to the several North American governments and to private enterprise the establishment of volcano and earthquake observatories.

TAKING into consideration the serious damage caused by fire at previous exhibitions, the executive committee of the Turin International Exhibition of 1911 has decided to open an international competition for preparations best adapted to render incombustible the wood and cloth structure of the exhibition, and will award a prize of lire 4,000 and two gold medals and two silver medals in this connection. The preparations must be such that they can be applied without visible alteration of the color and resistance of the materials.

THE President has signed a proclamation creating the Jewel Cave National Monument within the Black Hills National Forest, South Dakota. This remarkable cave, which is located thirteen miles west and south of Custer, the county-seat of Custer County, in a limestone formation, is believed by geologists to be an extinct geyser channel. The National Monument will embrace an area of 1,280 acres. This cave, which was explored as late as 1900, has been found to consist of a series of chambers connected by narrow passages with numerous galleries, the walls of which are encrusted with a magnificent layer of calcite crystal. The opening of the cave is situated in Hell Canyon, the walls of which are high and precipitous. The surface of the country in which the cave is located consists of a high rolling limestone plateau about 6,000 feet above sea level. The area is almost entirely covered by a forest of bull pine, a considerable portion of which is merchantable, while the remainder consists of a vigorous young growth. The Jewel Cave National Monument will now be given permanent protection by virtue of the Act of June 8, 1906, which provides that objects of scientific interest may be declared National Monuments if such action is deemed necessary for their preservation and protection.

UNIVERSITY AND EDUCATIONAL NEWS

By the will of Mrs. Amy Sheldon, of Newport, a bequest of \$300,000 to Harvard University is made in the codicil. It is requested that the money be used for the rebuilding or enlargement of the university library building known as Gore Hall, but if the corporation does not desire to use the money in this way it may do otherwise. In addition to this bequest the university is to receive a portion of the residuary estate, to be known as the Frederick Sheldon fund, the income to be used for the promotion of traveling by students after graduation.

By the will of Royal L. Smith, of Plattsburg, N. Y., various public bequests are made and the residue of his estate is to form a trust fund to educate the boys of Clinton

County by furnishing them funds to pay their expenses at preparatory schools and colleges. The daily papers state that this fund will amount to at least \$2,000,000 and probably to \$3,000,000.

By the will of the late Mary E. Ives, Yale University receives \$10,000 for the Art School, and \$10,000 for a fellowship in philosophy for women.

By the will of Edward Hall Cole, of Brooklyn, \$9,000 is given to St. Lawrence University, at Canton, N. Y.

MR. WILLIAM S. MATHER has given \$5,000 to Trinity College to be added to the fund for the payment of salaries.

THE contract for the erection of the new building for the College of Physicians, of Philadelphia, was awarded January 28. The building will cost \$300,000, and is to be erected at Twenty-second and Ludlow Streets. It will be a two-story fireproof brick and stone structure, 110 by 150 feet, containing a museum, lecture hall, library, laboratory and portrait gallery. It is said that the work of erection will be started at once.

At the January meeting of the regents of the University of Michigan, architects were authorized to draw up detailed plans and specifications for a new chemistry building. The structure, which will be three stories and a basement in height, is to be 270 feet long and 150 feet wide, with the 150 foot front located on North University about 75 feet west of the gymnasium—where the dental building is now situated. It will be of brick with stone trimmings and with interior of reinforced construction throughout. There are to be two interior courts separated by a crossbar connecting opposite sides of the building. The cost complete will probably be \$275,000.

Nature, quoting from the *Pioneer Mail* states that the Maharaja of Darbhanga, has made a gift of nearly £17,000 to the Lieutenant Governor for the purpose of constructing a library building in connection with the Calcutta University.

At the midwinter commencement of the University of Nebraska, on February 14, there

were graduated 16 bachelors of arts, 10 bachelors of science, 3 bachelors of laws, 3 masters of arts and 1 doctor of philosophy. Those receiving advanced degrees are as follows: Doctor of philosophy: Brayton Howard Ransom in zoology; thesis—"Some Cestodes from North American Birds." Masters of arts: Venus Worrell Pool in botany; thesis—"Some Tomato Fruit Rots." Leva Belle Walker in botany; thesis—"A New Form of *Sphaeropsis* on Apple" and "Zonation in Artificial Cultures of Fungi." John Bennett Whelan in chemistry; thesis—"Studies in the Reductions of Aldehydes and Ketones."

THE new medical laboratories building in connection with Queen's University, Kingston, Ont., was opened formally on January 14. Biology, histology, pathology, physiology and bacteriology will occupy this building. The Ontario government contributed \$50,000 toward this new building.

DR. HENRY T. BOVEY, dean of the faculty of applied science at McGill University, has resigned to accept the principalship of the Imperial College of Science and Technology, London.

THE Rev. C. L. White has resigned the presidency of Colby College to engage in work for the Baptist Home Mission Society.

PROFESSOR E. HERSHEY SNEATH, who resigned his chair at Yale University two years ago owing to ill health, has accepted an appointment as lecturer on philosophy in the graduate school. Dr. Roswell P. Angier has been promoted to an assistant professorship of psychology.

HOWARD E. SIMPSON, instructor in geology at Colby College, Waterville, Maine, has been appointed associate professor.

MR. G. G. CHISHOLM has been appointed lecturer on geography at Edinburgh University.

THE council of the University of Sheffield has appointed Mr. John L. Annan, M.B., Ch.B. (Edin.), to the post of demonstrator in anatomy. Mr. Annan is at present at the University of Edinburgh.